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THE STANDARDIZATION OF SURGICAL SERVICES
By J. V. McKenna 3

INVENTORY POLICIES AND RELATED NUMERICAL APPROXIMATIONS
By Charles E. Clark and Alan J. Rowe 8

AN ANALYTIC SOLUTION TO THE LEAST COST TESTING SEQUENCE PROBLEM
By L. G. Mitten 17

ON OBTAINING CONSISTENCY IN APPLICATION OF PREDETERMINED TIME SYSTEMS
By Clarence W. Frederick 18

ELEVENTH ANNUAL NATIONAL CONFERENCE ANNOUNCEMENT 20

PRESIDENT'S MESSAGE
By Frank J. Johnson 21

INSTITUTE INTERESTS 24

READER COMMENTS 30

PROFESSIONAL RELATIONS 32

RECENT READABLES 33

I. E. OPPORTUNITIES 36

AIIE MEMBERSHIP ROSTER 38

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The Standardization of Surgical Services

by **J. V. McKENNA**

Associate Professor of Industrial Engineering, Syracuse University

THE standardization of surgery has been a topic of discussion among surgeons for about forty-five years. During this time, about nine articles on the subject have been published by reputable medical journals on this continent. These articles range from speculation as to the probable advantages of standardization to a variety of attempts to analyze the situation experimentally.

The earliest proponents of standardization in surgery seem to have anticipated its major advantages rather well.

1. Determination of the best method of doing things (2) (5) (6).
2. Universal usage of the best method (2).
3. Reduction of operative time (3) (5).
4. Reduction of risk through:
   a. Reduced span of concentration (3) (6).
   b. Greater individual skill (3) (6).
   c. Improved teamwork (6) (9).
5. Greater facility in training surgeons (3) (5) (6) (8).
6. Financial economy (5) (6).
7. Reduced fatigue (6) (8).

These advantages if only partially realized, would be well worth the cost of achieving them. Despite the forty odd years which have passed since the idea was first brought forward, however, little standardization has been accomplished. Aside from a few procedures which are performed in about the same way everywhere, methods differ greatly from one surgeon to another, or at least from one medical school to another. There are often half a dozen ways of carrying out the same procedure and apparently little concern that one of them may be much superior to all the others.

RESERVATIONS ABOUT STANDARDIZATION

The major objections raised by surgeons to any attempt to analyze surgical techniques may be listed as follows:

1. There is no "best" way of performing a surgical operation. Cases differ and so do surgeons. Different methods are made necessary by the different conditions under which surgery is carried out.
2. Speed-up is not consistent with the welfare of the patient. The purpose of surgery is the welfare of the patient. It cannot be sacrificed to save time. Everything which ought to be done must be done and done carefully.
3. The time to be saved is not of great consequence either to the patient or to the surgeon. Anesthesia is improving, surgical shock is being reduced and even in complicated procedures like open-heart surgery, the blood-oxygenator provides adequate time for complicated repairs.
4. The advantages to be gained from standardization are only speculative. They have never been properly demonstrated.

COMMENTS REGARDING RESERVATIONS

It is not difficult to argue with most of these views on purely logical grounds. Perhaps the best arguments may be summarized as follows:

With regard to method, the Industrial Engineers reason that if there are several ways of doing the same thing, all are not likely to be equally good. They, therefore, advise taking the better elements from each of the methods extant to construct a new method which should be better than the others. Then everyone should use this "best" method. In general, the surgeons seem to appreciate this argument but contend that the different techniques for performing the same surgical procedure are not really for doing the same thing. The patients are different, the surgeons are different, and the anomalies they are seeking to correct are different from one patient to another. Not only this, but often the exact nature of the anomaly is only revealed by surgery so that previously made plans have to be revised. Thus, it is desirable to have half a dozen ways from which to choose.

On the other hand, there have been prominent surgeons who have argued that there is one best way of carrying out a surgical procedure. Lawrence and Berry stated quite unequivocally that, "We believe that there is one best way of performing a surgical operation" (6). Along the same lines, McCarty wrote, "It is advisable in addition to standardize every motion procedure so that a fixed type of operation can be used in every case in which variations from predetermined technic are not indicated" (8).

It is worth pointing out in regard to the one best method argument, that a surgical procedure, like any manual activity, is made up of a number of elements. How large these elements are depends upon how finely the operation is divided. For some purposes, it may be divided into four elements, preparation, dissection, re-

pair and cleanup. For other purposes, it may be divided into literally hundreds of disparate units, such as retract, suture, etc. Some of these small units of work may be performed in dozens of ways. Take suturing for example, one may decide to use intermittent or continuous suturing or select from a variety of suturing materials. No engineer can specify which is best in a given case. That is the job of the surgeon, but when the choice has been made, what is the best set of motions to perform the desired function? That is the job of a work analyst and it needs a professional. If standard surgical techniques are possible, they will be combinations of best methods for performing small elements of work. But, whether they are possible or not, it may still be worthwhile to seek out the best way of performing the elements.

Objections to standardization on the grounds that it encourages speed-up can be sustained only on the basis of ignorance of the true purpose of standardization. Speed-up implies haste. It suggests speed as an end in itself or as a means of financial economy without regard for care, safety or even the performance of a complete job. Far from encouraging speed-up, standardization prevents it. Webster defines a standard as "that which is established by authority, custom, or general consent as a mode or example . . . that which is proper and adequate for a given purpose" (12). Thus, the first requirement of a standard is that it be proper and adequate for the purpose intended. Thus, where slowness and deliberateness seem appropriate in the interest of safety, proper standardization would recommend it. Previous investigators in this field are in complete agreement on this subject. Gilbreth writes, "In no way does the increased efficiency due to motion study 'speed up' the surgeon nor give him more to think about at critical times" (3). Regarding the same point, Lawrence and Berry wrote, "We especially wish to note that this is not a speed-up but rather, a case of 'no haste, no waste' and that the time saving comes entirely from the economy of motions and improved sequences without increase in the rapidity of any motion" (6).

The argument that the amount of time which can be saved is not of consequence either to the patient or to the doctor, is based on a number of assumptions:

1. The amount of time to be saved has been estimated with some accuracy.
2. That the principal purpose in saving time is to shorten the operation.
3. That time is the only saving involved.

None of these assumptions are entirely warranted. Some authorities have ventured a guess at the amount of time likely to be saved, "more than 10%" (5), but never has an estimate of the time to be saved, accompanied by a measure of its reliability, been worked out. Thus, any attempt to place a value upon the time to be saved is premature. Certainly a substantial reduction in the time required to perform an operative procedure would be of value to the patient and even a quite small saving of time might make the difference between success and failure in a few critical cases. However, the main purpose of saving time is not to reduce the length of the operation but to make possible more surgery in a given length of time, deliberate careful work where it is needed, and time for more rest, more analytical work, and a more complete and careful job generally.

The final argument that the advantages to be gained through the standardization of surgery have never been demonstrated, is more difficult to answer. One may say that they are professional opinions of surgeons stated in their best technical publications. There is considerable agreement among them, but some differences also. The facts to support their views are not conclusive. Take, for example, the question of supply tables. In 1939 Lawrence and Berry (7) recommended:

1. Dividing the instrument supply tables into two units, one for instruments and the other for supplies.
2. Using special semi-circular tables with their total area within the user's normal grasping area.
3. Re-arranging the various tables in the operating room to facilitate the free flow of supplies and instruments from the nurses and back again.

They provided diagrams of layouts for three general classes of operations. These changes were designed to: a. minimize reaches and moves, b. encourage the synchronous use of both hands, c. enable the whole surgical team to face the operative field continuously and d. reduce fatigue.

McCarty says of the Lawrence and Berry arrangement, "Although theoretically an ideal plan, the system seems to restrict the free area about the operative field when more than one surgical assistant is used, and the supply nurse seems to be placed dangerously near the anesthetist" (8). The divergent views of these men regarding layout are given quite simply as opinions. Neither attempted to support his views with data. Nevertheless, Lawrence and Berry and McCarty seem to have produced the best investigations in the field so far. The observation that their conflict over layout seems to be based on opinion rather than substantial data can be applied equally well to all the work done in this field, a short resume of which is given in the abstracts from American references at the end of this article. What seemed to be needed is a scientific method for analyzing surgical operations.

In a recent article in a British medical journal, Sir James Patterson Ross comments upon this need (13):

> Trotter pointed out very clearly the conflict that exists is between a practical art like surgery, success in which depends upon judgment, intuition and skill, and the exactitude of science which demands the elimination of the human faculty. Yet this conflict must not be made the excuse for failing to make clinical methods as accurate as possible. The clinical scientist has to attempt to resolve the conflict by devising methods of investigation, the results of which can be correlated with clinical observation.

Motion study is one such method. No informed person will argue that it is perfectly adequate but it has been steadily improved and is capable of further development to fit special needs.

THE KINDS OF EXPERIMENT NECESSARY

The analysis of a surgical service is not a simple thing. So many activities are involved, so many facilities, so many people, all from different levels in the hospital hierarchy and outside, and all with their own special interests which often seem most important to them. Some of the things which ought to be analyzed are the following:

1. Efficient use of the surgical service; schedules, cancellations, delays between operations, preparing and cleaning up the operating room.
2. Physical facilities and their arrangement; the arrangement and design of rooms—operating room, scrub room, radiological and pathological facilities; design and arrangement of tables, stands, and other ancillary equipment; design and arrangement of instruments.
3. Preparation of the patient; positioning, draping, anesthesia, etc.
4. Delays in surgery; teamwork, communications, pre-operative planning, training of assistants, etc.
5. Perfection and standardization of surgical techniques; the balance of work between surgeons and assistants, the balance of work between the body members of the surgeon, etc.

Some of these studies will be gross, mechanical and routine. Methods adequate for investigating the efficient use of the surgical service, the physical facilities and their arrangement, and the preparation of the patient are already available to us. Micromotion study in its present form seems nearly adequate for studies leading to the standardization of surgical techniques. However, there exists a serious lack of methods adequate for isolating the subtleties of teamwork and communications. In this area, creative work of the highest order will be needed.

PROFESSIONAL METHODS ANALYSTS NEEDED

The surgeons need not and should not attempt methods analysis on their own. During an operation, the surgeon must concentrate on the task at hand. He has no time to think of the generality of such operations, to observe the movements of his assistants or to speculate upon the origin and causes of delay. He is a part of a surgical team and of the communication system which enables it to function. He cannot stand back to observe either impersonally. In additon, methods analysis requires special interests and special techniques. The function to be studied will demand not only all the know how, but all the ingenuity and creative ability of the professional methods analyst.

As an example of the kind of problem involved, we may consider the relationships which exist between teamwork, communications, authority and method as they apply in the operating room. In this regard, Temple Burling writes as follows (11):

> What is actually happening is that the changing needs of the patient as they develop in the course of the operation, determine what everybody does. When the surgical team has worked long enough together to have developed true teamwork, each member has such a grasp of the total situation and of his role in it, that the needs of the patient give unequivocal orders. This is the highest and most efficient type of cooperation known. It is so efficient that it looks simple and even primitive. It is possible only where every member of the team knows not only his own job thoroughly, but enough about the total job and that of each of the other members to see the relationship of what he does to everything else that goes on.

It is apparent that this type of cooperation can be achieved only under circumstances where each member of the team is able to perceive for himself the changing needs of the patient. This would seem to imply that each member of the team should have an uninterrupted view of the patient and the instruments which record his physical condition. Lawrence and Berry agree, "An operation should have the continuous undivided attention of the whole operating team. It should not be necessary for any of them to turn around at all" (7). Temple Burling states that this degree of cooperation is based upon everyone knowing his own job, the total job, and that of each of the other members of the team. It is developed through working together. Unfortunately the opportunity to work together as a surgical team is not easily come by in the large modern hospital. Thus, a standard technique would seem to be a shortcut toward the kind of cooperation that seems desirable. Here, again Lawrence and Berry agree, "Good teamwork can only be expected if all understand the same technic" (6). There are many things that one would like to know about this relationship. Would the adoption of a standard technique make possible the achievement of a higher level of teamwork? What effect would it have upon the amount of practice a team needed? How often is this ideal of communication achieved, and when it is not, what takes its place? What conditions encourage it? What conditions inhibit it? These are questions which cannot be answered from present knowledge nor even with present analytical techniques. The engineer who chooses to specialize in the study of surgical techniques will have to learn to work on two frontiers at once. On the medical frontier, he will attack each problem with the best analytical tools available. On the engineering frontier, he will try to develop the new tools needed to solve new problems. He will need creative genius more than mere technical competence.

The basic problem is an old one; to prove that standardization is appropriate in an area of manual activity where its potential is not immediately apparent. But standardization has been proven useful in hundreds of such areas. It is not long ago that standards in maintenance were considered impractical. Now they are fairly common. In surgery there is understandably a little more

reluctance to begin and it seems reasonable to expect that more solid proof will be needed for acceptance. But the cumulation of a series of well-designed and well executed experiments will ultimately provide the answer one way or the other. And the answer is worth obtaining now.

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(1) Nock, Albert J., "Frank Gilbreth's Great Plan to Introduce Time-Study into Surgery," *American Magazine*, Vol. 75, March, 1913, pages 48-50.

An article by a popular writer in a popular magazine of the time. It is important only because it appears to be the first publication regarding the use of motion study in surgery.

The purpose of the article seems to be to introduce Gilbreth's ideas regarding the use of motion study in surgery, but it goes on to discuss hospital administration and particularly the idea of hospital administration by doctors. It points out that much inefficiency is built into the situation by the planning and architecture of the hospital itself.

(2) Dickenson, Robert L., M.D., "Standardization of Surgery: An Attack on the Problem," *Journal of the American Medical Association*, Vol. 63, No. 9, August, 1914, pages 763-765.

A serious article by a medical doctor in a first-rate medical journal.

The article points out the almost complete lack of standardization in surgery. "For the simple abdominal incision, where every factor may be worked out to standard, who has run a long course of tests? In stitching and tying, have we settled what are the swiftest motions as a peasant lacemaker has or do we ever go into training for correct form?" He points out that standardization is necessary in order to: 1. determine what is the best method of doing things, 2. promote the universal usage of the best method, 3. protect patients from incompetency, and 4. make possible the promotion of surgeons on the basis of merit.

The article is frankly a statement of the opinions of three men; Gilbreth, Taylor and Dickenson.

(3) Gilbreth, Frank B., "Motion Study in Surgery," *Canadian Journal of Medicine and Surgery*, Vol. 40, No. 1, July, 1916, pages 22-31.

F. W. Taylor believed "That the surgeon was the best mechanic and the best teacher of learners of anyone in any craft." Gilbreth reports that his recollection from more than 200 important operations which he observed, was at variance with Taylor's viewpoint. Nevertheless, he writes that "We proceeded to investigate the hospital from the standpoint of transference of skill, motion study, and measured functional management, that we might learn any advance methods of teaching the trades for use in connection with our work of installing scientific management.

"After visiting some of our most prominent hospitals, we found that the surgeons could learn more about motion study, time study, waste elimination, and scientific management from the industries, than the industries could learn from the hospitals. We then and there, decided to make a vigorous campaign to revolutionize the present methods of hospital management and to teach surgeons our methods of motion study, that waste in the transference of skill in surgery might be eliminated and that the best methods in the mechanical trades of the industries might be available and at the service of the surgeon and the managers of hospitals."

Gilbreth remarks about the great number of special tools used in surgery, and especially the unusual ones designed by surgeons themselves. He points out that this great multiplicity of tools makes it difficult for anyone to become highly skillful in their use. "Great practice with comparatively few tools is one of the laws of the most efficient use of tools."

Gilbreth remarks also about the lack of standardization in surgical technique. He implies that the main benefit of standardization would be the greater facility made possible in the training of new surgeons. He then goes on to describe the process of work measurement as it may be applied to surgery. He is quite certain that "the motions of the surgeon are then the units to be measured."

Gilbreth points out that "In no way does the increased efficiency due to motion study 'speed up' the surgeon, nor give him more to think about at the critical times."

(4) Pool, Eugene H., M.D. and Bancroft, Frederick W., M.D., "Systematization of a Service," *Journal of the American Medical Association*, Vol. 69, No. 19, November, 1917, pages 1599-1603.

A report by two medical doctors of some elementary methods work performed by them in the operating room. They are sold on systematization or standardization for the same reasons that Dickenson was. In addition, they point out that "with the large service of the present day (1917), the complicated methods of diagnosis, the large staffs and the rapid turnover, systematization has become essential."

The article goes on to explain the work done by the authors in three areas: 1. The analysis of operative results, 2. Arrangement of work in the wards, 3. Operative techniques. The movements of nurses were analyzed using flow chart principles and economies were effected by rearranging the room, replacing small instrument tables with larger ones and by providing instrument tables of adjustable height. A hand signal system was adopted to facilitate communication between the surgeons and the instrument nurse.

(5) Welton, Thurston Scott, M.D., "In Regard to 'Rhythmic Surgery,'" *American Journal of Surgery*, Vol. 41, No. 3, September, 1938, pages 371-372.

This is an editorial rather than an article introducing "The first of a series of papers on improvements of surgical technic and operating room management, based on studies of motion and efficiency," by Doctors W. H. Lawrence and C. H. Berry.

The author points out that despite the great improvements in manufacturing procedures resulting from motion study in industry, the surgeon "has maintained his right to follow his personal methods, to train his assistants in those methods, and to use whatever instruments, supplies and technics he found advisable." The result has been that a. It is impossible to determine for a given condition which surgical technique is best. b. The procedures used are unnecessarily economically wasteful and inefficient. c. Personally trained assistants find difficulty working with others. d. A wasteful reduplication of instruments. e. Repeated changes in the operating room. f. An excess of assistants and nurses are needed. He points out that "Few scientific studies have ever attempted to simplify the myriads of procedures, find their common denominator and evolve a best way for the performance of each step."

(6) Lawrence, W. H., M.D. and Berry, C. H., M.D., "Rhythmic Surgery," *American Journal of Surgery*, Vol. 41, No. 3, September, 1938, pages 393-398.

Doctors Lawrence and Berry believed that, "Success in any field where manual movements are required, is marked by outstanding rhythm (measured and balanced move-

ments)." They, therefore, became personally competent in micromotion analysis and made studies of appendectomies for the stated purposes of a. eliminating unneccessary motions, b. making the motions used more effective, and c. building up a sequence of motions for maximum efficiency.

This appears to be the first actual use of micromotion study to analyze surgical procedures. Doctors Lawrence and Berry perceived a problem and sought out a method for solving it. Perhaps their final opinion is given in the first page of their article, "We now believe that all surgeons can achieve real skill and true rhythm through motion study of their own activities; thus we are convinced that the practice of motion economy as applied to industry should be widely used in surgery."

(7) LAWRENCE, W. H., M.D. AND BERRY, C. H., M.D., "Rhythmic Surgery: Arrangement of the Operating Room," *American Journal of Surgery*, Vol. 43, No. 3, March, 1939, pages 669-674.

The second article by Lawrence and Berry deals with the arrangement of the operating room. It recommends: 1. The operating room should be of ample size. 2. A separate room adjoining the operating theatre should be used for the administration of anesthetic in order that the patient may be moved into the already prepared operating room rather than having the arrangement assembled about the operating table after the patient has been brought in. 3. The instrument and supply tables should be redesigned in order to: a. minimize reaches and moves, b. encourage the synchronous use of both hands, c. enable the whole surgical team to face the operative field continuously, d. reduce fatigue. 4. The instrument and supply tables should be divided into two units in order to provide for nurse training under the supervision of a registered nurse. 5. The tables for instruments and supplies should be symmetrical and with their contents so laid out as to facilitate the almost equal use of left and right hands. 6. The instruments should be kept in a fixed location in order to avoid searching thus enabling the surgeon to keep his eyes on the operative field. Commonly used instruments should be pre-arranged for the surgeon to pick up for himself. 7. The instruments to be picked up by the instrument nurse should be pre-arranged so that she may pick up the instrument she wants automatically without looking for it.

(8) MCCARTY, FRANKLIN B., M.D., "Motion Study in Surgery," *American Journal of Surgery*, Vol. 65, No. 2, August, 1944, pages 197-209.

The preceding articles may seem quite ancient but the present one by Franklin B. McCarty, M.D., is of World War II vintage and modern by any standards.

McCarty explicitly recommends the standardization of surgical technique on at least seven specific occasions. The extent to which he would carry standardization is quite clear from the following quotations: 1. "It is advisable, in addition, to standardize motion procedure so that a fixed type of operation can be used in every case in which variations from predetermined technic is not indicated. Failure to adopt and carry out a repetitive technic in any one kind of operation may mean that no outstanding method has been developed or may indicate lack of thorough organization of a surgical group." 2. "Fixed types of operation can be applied to large groups of cases. These should be specified and carried out uniformly by the entire surgical service and variation or additions should be considered and discussed by the group before being introduced by an individual member." 3. "No single time standard can be set for different men but use of uniform methods will permit each man to complete the work in the shortest time compatible with his talents." 4. "A standard method of skin preparation, positioning and draping should be adopted." 5. "Proper training should begin the first day the young interne begins his training in operative surgery and it is important that they not be permitted to practice methods which must later be unlearned." 6. "Material such as sponges, pads, sutures should be reduced to the smallest variety that will adequately serve the purpose." 7. "Instruments should be the simplest in design and fewest in number that will permit carrying out of the entire procedure."

(9) MCKENNA, JOSEPH V., "The Case for Motion and Time Study in Surgery," *American Journal of Surgery*, Vol. 94, No. 5 November, 1957, pages 730-734.

(10) SMALLEY, HAROLD E., "Industrial Engineering in Hospitals," *Journal of Industrial Engineering*, Vol. 10, No. 3, May, 1959, pages 171-175.

(11) BURLING, TEMPLE, "The Patients' Needs and Hospital Organization," *Essays on Human Aspects of Administration*, Bulletin 25, August, 1953, New York State School of Industrial and Labor Relations, Cornell University, Ithaca, New York.

(12) Websters New International Dictionary, 2nd Edition, p. 2455.

(13) ROSS, SIR JAMES PATTERSON, K.C.V.O., M.S., PRCS., "The Scientific Approach to Surgery," *British Medical Journal*, July 11, 1959.

Ed. Note: These references have been listed in chronological order because of their significance when listed in this manner.

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Inventory Policies and Related Numerical Approximations

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IN BRIEF outline, the problem of this paper is the following. Stocks are maintained to meet a demand. When the stock level reduces to X items, action is initiated for stock replenishment of Y items. The problems is to determine X and Y in the light of costs of carrying stock in inventory, costs of ordering stock replenishment, a run-out percentage, and the statistical properties of customer demand and lead times.

Effective mathematical solutions exist and are presented. However, the mathematical details of these analyses require more time, mathematical ability, and computational efficiency than one wishes to require of operating personnel. The distinctive contribution of this article is the presentation of an approximate solution of the problem. The approximation is concerned with economic order quantities and safety stocks rather than the more complex, but ideally preferable model, of the mathematical statistician. The simplified procedures are closer to the intuitive insights of the Industrial Engineer, and the calculations are within the capability of a statistical clerk untrained in engineering or advanced mathematics.

The approximate solution is of the folowing type. If the customer demand could be predicted with certainty, and if the lead time for stock replenishment were known with certainty, the selection of the replenishment level X would be trivial. One would order replenishment to arrive exactly when stocks become exhausted. Furthermore, the replenishment quantity Y could be determined by the classical economic order quantity formula presented. If, however, customer demand or the lead time is uncertain, the replenishment level X can not be so determined. In such cases, it is common practice to take X equal to an average demand during lead time, plus a "buffer" or "safety" quantity of stock. The determination of the safety stock is a nonelementary problem which we shall by-pass at present. Simultaneously, the replenishment quantity Y can be determined by the economic order quantity formula. The resulting procedure has two apparent deficiences. In the first place, this independent selection of X and Y will not, in general, lead to the desired run-out percentage. This problem can be resolved easily by first calculating Y, and then determining the safety stock consistent with the required run-out percentage. A second deficiency seems more serious. The solution is not optimum. The economic re-order quantity formula is used where the conditions assumed in its derivation do not hold precisely (the derivation of the formula does not face the possibility of uncertain demand or lead time). However, this article shows that this relatively simple, ideally imperfect analysis, produces a result which differs very little from the optimum solution in many situations.

This fundamental objective of the paper is reached in section III. The exposition through that section is essentially nonmathematical. In later sections, the result is sharpened with the use of concepts of elementary statistics, such as those related to the normal distribution.

The two salient limitations of this article are the assumption of continual inventory surveillance, and the use of a run-out percentage rather than shortage cost. In many situations, stock replenishment must be ordered periodically, say, every Monday or on the first of each month. Such problems should be handled by the dynamic programming techniques of (1), (2), (4), and (5). Ideally, one should know the financial loss incurred when a customer order is received at a time of stock depletion. If this financial loss can be estimated, one can use the analysis of (3). However, one often finds that an analysis of shortage costs is impractical. In such cases, it is common for management to impose a service criterion in the form of a run-out fraction r which is used below.

The discussion is restricted to the analytical details of computing the optimum X and Y. We do not consider procedures for estimating the costs that appear in the formulas. Also, the problem of predicting demand is ignored. This problem, involving seasonality and trends in future demand, is in many situations more difficult than the problem of the present discussion.

I. THE ECONOMIC ORDER QUANTITY FORMULA

In later sections, we shall make use of the classical economic order quantity formula. The present section contains a derivation of that formula.

We assume that demand is predicted without error, and that there is a fixed lead time between initiation of stock replenishment action and the availability of the replenishment to meet demand. Hence, the replenishment can be ordered to arrive at the time stocks become exhausted.

This means that there is no problem in determining X, the stock level at which replenishment action is initiated. We shall determine Y, the replenishment quantity, to minimize a cost function constructed below.

Let C_o, the cost of ordering, be the dollar cost incurred each time action is taken to replenish stock. This is a cost per replenishment action.

Let C_i, the cost of carrying inventory, be the dollar cost of holding one item in stock for one day. Often, C_i, is expressed as $CI/365$ where C is the dollar investment in an item in inventory, and I is an annual interest rate. Let D be the daily customer demand which we assume constant. The number of days between replenishment actions is Y/D. The number of replenishment orders per year is 365 divided by this number, or $365D/Y$. This, multiplied by C_o, is the annual cost of replenishment actions, and the cost per day of replenishment actions is DC_o/Y.

The mean stock level over a period of time is $Y/2$ because the low stock level is zero, and the high level is Y. This implies that the cost per day of carrying stock is $YC_i/2$.

The cost computed on a daily basis of replenishment actions, and of inventory is

$$C = \frac{DC_o}{Y} + \frac{YC_i}{2}.$$

This cost per day, C, is a function of a single unknown Y. When Y is small, the first term is large; when Y is large the second term is large; there is some value of Y, not too large or too small, for which the cost C is smallest. This optimum value of Y is

$$Y = \sqrt{\frac{2DC_o}{C_i}} \qquad \text{Eq. 1.}$$

which is derived as follows. The derivative of C with respect to Y is

$$-\frac{DC_o}{Y^2} + \frac{C_i}{2},$$

and if this derivative is set equal to zero and solved for Y, we obtain the result in question. Numerical illustrations of the use of this formula will appear later in the article. The formula has been known and used for decades.

II. NUMERICAL ANALYSIS OF THE GENERAL CASE

The economic order quantity formula was derived under the assumption that demand can be predicted with certainty. We shall show in section III that this formula can be used in more complex situations. But first we shall solve a general problem of choosing an inventory policy when demand is uncertain. The solution will be presented in terms of a specific artificially constructed example.

As the basis for an illustrative example, we shall use Table 1. In this table d is a possible value of the demand during lead time; the lead time being the time between

TABLE 1

Demand During Lead Time

d	$P(d)$	$R(d)$	$S(d)$	d	$P(d)$	$R(d)$	$S(d)$
75	0	1.00	9.00	87	.05	.21	.79
76	0	1.00	8.00	88	.04	.17	.58
77	.01	.99	7.00	89	.04	.13	.41
78	.05	.94	6.01	90	.03	.10	.28
79	.08	.86	5.07	91	.03	.07	.18
80	.10	.76	4.21	92	.02	.05	.11
81	.10	.66	3.45	93	.02	.03	.06
82	.10	.56	2.79	94	.01	.02	.03
83	.09	.47	2.23	95	.01	.01	.01
84	.08	.39	1.76	96	.01	0	0
85	.07	.32	1.37	97 – ∞	0	0	0
86	.06	.26	1.05				

an instigation of action to replenish stock, and the time when the Y items arrive and are available to meet demand. The probability $P(d)$ in Table 1 is the probability that a demand during a lead time will be for d items. For example, Table 1 gives $P(80) = .10$, which means that we expect the demand during lead time to be for 80 items during 10 per cent of the lead times. The table indicates that the demand during lead time is always between 77 and 96 items, inclusive; a demand for 80 items occurs twice as often as a demand for 78 items, and ten times as often as a demand for 77 items.

Table 1 shows nothing about the lead time. We do not know whether it is fixed or variable. If the lead time varies from one replenishment action to another, this variation influences the variability of the demand during lead time. Also, the variability in the number of customer orders received per day influences the variability of demand during lead time. However, in Table 1 these two sources of variation are not separated. In section VII, we shall separate the variability of demand from the lead time variability.

In many real situations we do not know $P(d)$ accurately in the detail given in Table 1. However, no inventory policy can be set other than by pure guess-work if something is not known about the demand. Even if our knowledge of this demand is meager, such knowledge can be converted into a probability distribution like that of Table 1. This matter will be discussed in section IV. Sections V, VI and VII introduce systematic analyses applicable when information about demand is incomplete.

Table 1 contains a column of numbers $R(d)$, where $R(d)$ is the probability that the lead time demand will exceed d. For example, $R(96) = 0$ because the demand never exceeds 96, $R(95) = P(96) = .01$, $R(94) = P(95) + P(96) = .02$, $R(93) = P(94) + P(95) + P(96) = .03$, etc. Since the table gives $R(90) = .10$, we know that the lead time demand will exceed 90 items, i.e., be 91 or greater, during 10 percent of the lead times. The values of $R(d)$ are quickly computed in succession by the formulas $R(95) = R(96) + P(96)$, $R(94) = R(95) + P(95)$, $R(93) = R(94) + P(94)$, etc.

A number, $S(d)$, in Table 1 is the expected number of

customer orders received during a lead time after stock is depleted if the replenishment action is initiated when the stock level is $X = d$. For example, we find that $S(90) = .28$. To interpret this number, we suppose that the policy is to order stock replenishment when the stock reduces to $X = 90$ items (here, as elsewhere, stock is the stock on hand plus replenishment previously ordered and not yet delivered). If this policy is continued over a long period of time which covers many replenishment actions, the mean shortage per replenishment action is expected to be .28 items. The fact that $R(90) = .10$ implies that a shortage of zero can be expected during 90 percent of the lead times. If such zeros are averaged with the numbers short during the other lead times, the mean is expected to be .28. Hence, the shortage will average slightly more than one item every four replenishment actions. We should not confuse $S(d)$ with the average shortage in those instances in which shortage occurs. If replenishment action is initiated when the stock level is 90, the expected number of shortages during the 10 percent of the times that a shortage occurs is $S(90)/R(90) = .28/.10 = 2.8$ items. However, this last number does not enter the analysis.

The calculation of $S(90)$ could proceed as follows. The expected shortage is 1 times the probability that the shortage will be 1 item, plus 2 times the probability that the shortage will be 2 items, plus 3 times the probability that the shortage will be 3 items, and so on. If replenishment action is initiated when the stock level is 90, $S(90)$ is 1 times the probability that the lead time demand will be for 91 items, plus 2 times the probability that the lead time demand will be for 92 items, plus . . ., plus 6 times the probability that the lead time demand will be for 96 items. In other words,

$$S(90) = 1P(91) + 2P(92) + 3P(93) + \cdots + 6P(96).$$

This sum is evaluated with use of values of $P(d)$ in Table 1.

However, a simpler and briefer calculation of the values of $S(d)$ is the following. $S(95) = S(96) + R(95)$, $S(94) = S(95) + R(94)$, $S(93) = S(94) + R(93)$, etc. We shall not pause to justify this procedure by proof.

We shall determine X, the stock level at which replenishment is to be initiated, and Y, the number of items ordered at each replenishment action. Here, and until we reach section IX, it is assumed that each customer order is for one item. We need to know the cost C_o of each replenishment action, the cost per day, C_i, of carrying one item in inventory, the expected daily demand D, and the expected demand during lead time μ. In addition, we shall need $S(d)$, and the run-out fraction r. If, for example, r were assigned the value .01, we would determine X and Y so that over a long period of time one can expect 1 percent of customer orders to arrive when stocks are depleted.

From an abstract point of view, the inventory process is cyclic. After stock replenishment is received, there ensues a period in which customer orders reduce the stock level to X. Then replenishment action is instigated, customer orders reduce the stock level until the replenishment arrives, and the cycle is complete. During any cycle there may or may not be a shortage.

If a customer order arrives when stocks are depleted, the customer may accept delivery after stock replenishment arrives, or he may cancel the order. Let p be the fraction of customer orders which can be so deferred. If $p = .90$, then 90 percent of the customers will accept delay in delivery, but 10 percent will cancel orders when stocks are depleted. Since $S(X)$ is the expected number of orders which are received each cycle when stocks are depleted, the expected number of lost sales each cycle is

$$(1 - p)S(X).$$

Since the stock input to the process is Y items each cycle, the average number delivered to customers each cycle is Y. Hence, the expected number of customer orders received each cycle is

$$Y + (1 - p)S(X). \qquad \text{Eq. 2.}$$

Since D denotes the expected daily customer demand, our estimate of the expected number of days in a cycle is

$$\frac{Y + (1 - p)S(X)}{D}.$$

The reciprocal of this can be interpreted as the expected number of cycles per day (which, in most cases, will be a fraction such as .01), and if this reciprocal is multiplied by C_o, we obtain

$$C_1(X, Y) = \frac{DC_o}{Y + (1 - p)S(X)}$$

as the cost of replenishment actions expressed as a cost per day.

We turn to the cost of carrying stock. If there were never any shortage, the expected low level of stocks just prior to replenishment would be X-μ, the reorder point less the expected demand during lead time. However, the low point is actually X less the expected number of customer orders filled during lead time. Since $S(X)$ is the expected number of customer orders that arrive when stocks are depleted, μ-$S(X)$ is the expected number of orders received and filled prior to the arrival of stock replenishment. Hence, the expected low stock level is

$$X - \mu + S(X).$$

When replenishment in the quantity Y arrives, some of this stock is used immediately to fill back orders. The expected number of these back orders is $pS(X)$, the probability that a customer will accept delay multiplied by the expected shortage during a lead time. Hence, the expected increase in the stock level at the time of replenishment is $Y - pS(X)$. The expected high stock level is the

expected low level, plus this last number which reduces to

$$X - \mu + (1 - p)S(X) + Y.$$

We shall use the arithmetic mean of the expected low and high stock levels as an estimate of the mean stock level over time. The use of this arithmetic mean is not legitimate if r is high, say, greater than .05. The analysis, in case of large r, will be indicated in section VIII. The mean of the high and low stock levels is

$$X - \mu + \left(1 - \frac{p}{2}\right) S(X) + \frac{Y}{2}.$$

The product of this mean stock level by the cost of carrying one item one day is

$$C_2(X, Y) = C_i \left[X - \mu + \left(1 - \frac{p}{2}\right) S(X) + \frac{Y}{2} \right],$$

the expected cost per day of carrying stock. The total inventory cost per day is

$$\begin{aligned} C(X, Y) &= C_1(X, Y) + C_2(X, Y) \\ &= \frac{DC_o}{Y + (1 - p)S(X)} \qquad \text{Eq. 3.} \\ &\quad + C_i \left[X - \mu + \left(1 - \frac{p}{2}\right) S(X) + \frac{Y}{2} \right]. \end{aligned}$$

More precisely, $C(X, Y)$ is a cost which varies with X and Y, whereas the total inventory cost, however it may be defined, may include other costs which do not vary with X and Y. In determining the best X and Y to employ, one can ignore all costs which do not vary with X and Y.

We must introduce the run-out fraction. Since $S(X)$ is the expected shortage during a cycle, we obtain using Eq. 2.

$$r = \frac{S(X)}{Y + (1 - p)S(X)}. \qquad \text{Eq. 4.}$$

This last equation contains the two unknowns X and Y, and it can be solved for Y in terms of X. We obtain after simple manipulation

$$Y = \frac{1 - r + rp}{r} S(X). \qquad \text{Eq. 5.}$$

If this value of Y is substituted into Eq. 3, the cost $C(X, Y)$ reduces to

$$\begin{aligned} C(X) &= C_1(X) + C_2(X) \\ &= \frac{rDC_o}{S(X)} + C_i \left[X - \mu + \frac{1 + r}{2r} S(X) \right]. \qquad \text{Eq. 6.} \end{aligned}$$

This gives the cost C as a function of a single variable X. The graph of C as a function of X can be drawn, and the low point of the graph corresponds to the optimum value of X.

We shall give a numerical illustration of the use of this formula. We assume that the distribution of demand during lead time is given in Table 1. We calculate that

$$\begin{aligned} \mu &= 77P(77) + 78P(78) + \cdots + 96P(96) \\ &= 84.0. \qquad \text{Eq. 7.} \end{aligned}$$

We assume that the expected daily demand is $D = 4$. (From $\mu = 84$ and $D = 4$ we could infer that the average lead time is $84/4 = 21$ days, but we do not explicitly employ the lead time in the formula for C.) We assume that $C_o = \$5$, $r = .01$, $p = \frac{1}{2}$, and $C_i = \$2/365$. This value of C_i could arise if each item in stock involved an inventory investment of \$10 and the annual interest charge were 20 percent. For these parameters $C(X)$ reduces to

$$C(X) = \frac{.2}{S(X)} + \frac{2}{365} [X + 50.5S(X) - 84].$$

To build up a table of values of $C(X)$, we take a trial value of X, say, $X = 90$. We find in Table 1 that $S(90) = .28$. Substitution in the formula for $C(X)$ gives $C(90) = .8246$ dollars per day. In this way, one builds Table 2. This table reveals that the best choice of X is $X = 87$.

TABLE 2

X	$C(X)$	X	$C(X)$	X	$C(X)$
80	1.1905	87	.4882	90	.8246
86	.4920	88	.5272		

To get the corresponding Y, we use Eq. 5. Since Table 1 gives $S(87) = .79$, and since $r = .01$, and $P = \frac{1}{2}$, we obtain $Y = 79$. Thus, the optimum policy is to initiate a replenishment action for 79 items when stock on hand plus replenishment ordered but not yet delivered reduces to 87 items.

We shall see in section III how the optimum value of X can be easily approximated. Then Table 2 can be quickly computed by taking a few values of X near the approximate optimum.

III. A SIMPLE APPROXIMATION

In this section we point out that a simple calculation will approximate X and Y as obtained by the analysis of section II.

We consider the problem of section II. We shall apply the economic order quantity of section I to this problem. The conditions under which the economic order quantity formula were derived do not hold in the problem now under consideration. This is due to the fact that in the present problem lead time demand is uncertain. The economic order quantity formula was derived for the situation in which one can predict in advance the time at which stocks will be depleted, and the lead time for replenishment is fixed. In such a case, one could plan to have replenishment arrive exactly when the stock level reduces to zero. In the more general case of uncertain de-

mand this is impossible. However, it seems reasonable to expect that a good policy under uncertain demand will be one in which the stock level is low at the time replenishment arives. Hence, the optimum replenishment quantity under uncertain demand should be at least roughly the same as the economic order quantity.

On the basis of this intuition, we shall return to the numerical example of section II and apply the economic reorder quantity. Using Eq. 1. and substituting the values $D = 4$ items, $C_o = \$5$, and $C_i = \$2/365$ used in section II, we obtain

$$Y = \sqrt{7300}$$
$$= 85.44.$$

One might compare this with $Y = 79$ of the optimum policy in section II. However, a more proper comparison will be made later after this value of Y is adjusted. From Eq. 5. we can solve for $S(X)$ in terms of Y. Using $Y = 85.44$, $r = .01$, and $p = \frac{1}{2}$, we obtain

$$S(X) = \frac{.01}{1 - .01 + .005}(85.44). \qquad \text{Eq. 8.}$$
$$= .86.$$

To solve for X we note that Table 1 gives $S(86) = 1.05$ and $S(87) = .79$. We interpolate to get

$$X = 86.7. \qquad \text{Eq. 9.}$$

Our solution $Y = 85.44$ and $X = 86.7$ must be rounded off to integral values. We select $X = 87$ and compute the corresponding Y from Eq. 5. to be

$$Y = \frac{1 - .01 + .005}{.01} S(87),$$

and after obtaining from Table 1 the value $S(87) = .79$, $Y = 78.6$ which we round off to $Y = 79$.

Thus, we determined a value of Y, namely, $Y = 85.44$, by use of the economic order quantity formula. Corresponding to this value of Y there is only one X which will give the required run-out fraction of $r = .01$. This X is determined from Eq. 5. to be $X = 86.7$. In rounding off to integers we first adjust X to 87, and then the Y corresponding to the adjusted X is determined from Eq. 5. This last adjustment of Y guarantees that the run-out fraction will be $r = .01$ as required.

Since the computations of the present section employ the economic order quantity formula in a situation with uncertain demand, we do not have mathematical proof that our results are sound. In fact, we do not expect to obtain the optimum as it is correctly derived in section II. But comparing the results of this section with the optimum policy obtained in section II, we find that the approximate method gives the X and Y of the optimum solution. However, it must be remembered that the two results were not identical before initial solutions in fractions of an item were rounded off to integral values.

Suppose that one did not trust the approximate procedure of this section, and the exact analysis of section II were to be employed. It would be efficient to compute the economic order quantity $Y = 85.44$ and the corresponding $X = 86.7$ as was done in the present section. One would then build up a table of values of $C(X)$ for values of X near 86.7.

The approximate solution will not be so accurate for some values of the parameters, C_o, C_i, r, D, and p and for some distributions of lead time demand. Management should make a few computations by the methods of both sections II and III. In this way, it can be determined whether the approximation is adequate for the specific parameters and demands faced by a specific management. In most cases, it will be found that the approximate computations can be adopted.

IV. THE DISTRIBUTION OF LEAD TIME DEMAND

The analyses of sections II and III require the distribution of lead time demand as illustrated in Table 1. Usually one's information is incomplete, and the distribution must be approximated. For such an approximation it is usually best to use one of the analytical models of sections V and VI. However, we shall indicate in this section how the distribution of lead time demand can be approximated by elementary methods.

Suppose as a trivially simple illustration, we assume that the lead time demand is always between 1 and 5. We know that 3 is the most likely demand, and that 1 and 5 are less likely than 2 and 4. Nothing else is known. One might assume that the probabilities of demands of 1 and 5 are equal. In other words, $P(1) = P(5) = x$, where the unknown x is to be determined. It might seem reasonable to assume that $P(2) = P(4) = 2x$, and $P(3) = 3x$. Since the sum of the probabilities must be 1, we would have $x + 2x + 3x + 2x + x = 1$, or $9x = 1$. This would give $x = 1/9 = .11$, approximately. Finally, $P(1) = P(5) = .11$, $P(2) = P(4) = .22$, and $P(3) = .33$.

Alternatively, one might have the conviction that the demand would be 3, roughly half of the time, and that demands of 1 and 5 would be rare. One might subjectively set $P(3) = .5$, $P(2) = P(4) = .24$, and $P(1) = P(5) = .01$.

Groping in the manner illustrated would produce serious inaccuracies. But no inventory analysis can be sharp in the face of meager knowledge of demand and lead time. In most cases, one has enough information to justify one of the analytic models introduced below.

V. NORMALLY DISTRIBUTED LEAD TIME DEMAND

In our first analytic model, it is assumed that the lead time demand is normally distributed. This assumption is unacceptable in most situations. This point would seem to require emphasis because many writers restrict the applicability of their analyses to the case of normally distributed lead time demand. But in most situations en-

TABLE 3

Normal Approximation to Demand of Table 1

d	$P'(d)$	$R'(d)$	$S'(d)$	d	$P'(d)$	$R'(d)$	$S'(d)$
75	.011	.973	9.010	87	.072	.209	.622
76	.017	.956	8.037	88	.060	.149	.413
77	.025	.931	7.081	89	.047	.102	.264
78	.035	.896	6.150	90	.035	.067	.162
79	.047	.849	5.254	91	.025	.042	.095
80	.060	.789	4.405	92	.017	.025	.053
81	.072	.717	3.616	93	.011	.014	.028
82	.083	.634	2.899	94	.006	.008	.014
83	.089	.545	2.265	95	.004	.004	.006
84	.092	.453	1.720	96	.002	.002	.002
85	.089	.364	1.267	$97-\infty$	.002		
86	.083	.281	.903				

countered by the authors, it would be extremely unfortunate to calculate under the assumption of normality. Consider, for example, the distribution of Table 1. If the usual normal approximation to the demand of Table 1 is constructed, one obtains the probability distribution of the column headed $P'(d)$ in Table 3. In addition, Table 3 contains $R'(d)$ and $S'(d)$ computed from $P'(d)$ in the same way that $R(d)$ and $S(d)$ were obtained from $P(d)$. We can see in Tables 1 and 3 that when an inventory policy involves large values of X, the expected shortage, given by $S(X)$, is more than twice the value given by $S'(X)$. If X and Y are determined from the normal approximation, if the optimum policy has X between 92 and 94, and if r is the assigned run-out fraction, the actual run-out fraction will turn out to be greater than $2r$.

The reason for the inadequacy of the normal approximation in the case of Tables 1 and 3 is that the distribution of lead time demand is skewed; the possible values of the demand extend farther above the mean than below (the mean is 84, and $96 - 84 = 12$ is greater than $84 - 77 = 7$). We say that the distribution of demand has a long right-hand tail. In real situations such tails are typical. If there are different classes of customers with different demand characteristics, one would expect the demand distribution to be skewed. Furthermore, when the lead time is uncertain, skewness is expected. For example, if both the daily demand and the lead time are normally distributed, the lead time demand will be skewed (3). Some writers consider lead time demand with a Poisson distribution, and this distribution is skewed.[1]

The theoretical basis for hoping the lead time demand to be normal is the central limit theorem. This idea is relevant, and lead time demands are approximately normal in many situations. However, as is apparent in section II, the solutions X and Y involve the values of $S(X)$ only for large demands, typically. This means that in typical cases, essentially the only part of the distribution of lead time demand that influences the solution X and Y are the values in the right-hand tail. When any approximately normal distribution is approximated by a normal distribution, the approximation is usually least accurate in the tails. Hence, it is dangerous to rely on the tendency towards normality guaranteed by the central limit theorem. The model of this section is sometimes applicable, but it should not be used blindly. However, the more accurate model of section VI employs the results to be developed for the present model, and the present section constitutes a first step in a more careful analysis.

Let $\phi(t)$ be the probability density of the standard normal distribution. Let μ and σ be the expected value and standard deviation of the lead time demand. We approximate the probability that the lead time demand is for d items by

$$\frac{1}{\sigma}\phi\left(\frac{d-\mu}{\sigma}\right).$$

We recall that $S(X)$ is 1 times the probability that the lead time demand is for $X+1$ items, plus 2 times the probability that the demand is for $X+2$, plus 3 times the probability that the demand is for $X+3$, etc. Hence,

$$\begin{aligned} S(X) &= \frac{1}{\sigma}\sum_{i=1}^{\infty} i\phi\left(\frac{X+i-\mu}{\sigma}\right) \\ &= \frac{1}{\sigma}\sum_{j=X+1}^{\infty}(j-X)\phi\left(\frac{j-\mu}{\sigma}\right) \\ &\cong \frac{1}{\sigma}\int_{X+1/2}^{\infty}(x-X)\phi\left(\frac{x-\mu}{\sigma}\right)dx \end{aligned}$$

because if $\alpha(x)$ is a function of x,

$$\alpha(a)+\alpha(a+1)+\cdots+\alpha(b-1)+\alpha(b) \cong \int_{a-1/2}^{b+1/2}\alpha(x)dx.$$

The change of variable

$$t=\frac{x-\mu}{\sigma}$$

and the notation

$$u=\frac{X+\frac{1}{2}-\mu}{\sigma} \qquad \text{Eq. 10.}$$

lead to

$$\begin{aligned} S(X) &\cong \int_u^{\infty}(\sigma t+\mu-X)\phi(t)dt \\ &= \frac{\sigma}{\sqrt{2\pi}}\int_u^{\infty} te^{-t^2/2}dt+(\mu-X)\int_u^{\infty}\phi(t)dt. \end{aligned}$$

If $\Phi(t)$ is the accumulated normal probability from $-\infty$ to t,

$$\begin{aligned} S(X) &\cong \frac{\sigma}{\sqrt{2\pi}}\left[-e^{-t^2/2}\right]_u^{\infty}+(\mu-X)\left[\Phi(\infty)-\Phi(u)\right] \\ &= \sigma\phi(u)+(\mu-X)\left[1-\Phi(u)\right] \end{aligned}$$

[1] However, the authors have never encountered a real situation in which it would be legitimate to assume the lead time demand to be Poisson. Hence, although it is possible to construct simple nomograms for the case of Poisson demand, we do not recognize their utility.

which, with the help of Eq. 10. reduces to

$$S(X) = \sigma[\phi(u) + u\Phi(u) - u] + \tfrac{1}{2}[1 - \Phi(u)]. \quad \text{Eq. 11.}$$

To illustrate the utility of this model, we return to the numerical illustration of section II. We calculate from Table 1 that the expected value of d^2 is

$$(77)^2(.01) + (78)^2(.05) + \cdots + (96)^2(.01) = 7074.78,$$

and this permits us to write, using Eq. 7.,

$$\sigma^2 = 7074.78 - (84)^2$$
$$= 18.78,$$

from which, by extracting the square root, we get

$$\sigma = 4.334. \quad \text{Eq. 12.}$$

We could now reconstruct Table 2 using Eq. 11. instead of the correct values of $S(X)$ given in Table 1. This amounts to a numerical procedure for computing the optimum X and Y when the lead time demand is assumed to be normally distributed. The calculation uses only the expected value and standard deviation of lead time demand rather than the complete distribution given in Table 1. We shall not carry out this computation because we shall obtain the result by another computation which can be called analytic rather than numerical.

In the use of the table of $S(X)$ in Table 1, we must restrict X to be integral. However, Eq. 11. permits X to vary continuously. This fact permits the following mathematical analysis. We return to $C(X)$ as given in Eq. 6., and we now assume that $S(X)$ in this formula is given by Eq. 11. We compute the derivative of $C(X)$ with respect to X to be

$$C'(X) = -\frac{rDC_o}{[S(X)]^2} S'(X) + C_i\left[1 + \frac{1+r}{2r} S'(X)\right]. \quad \text{Eq. 13.}$$

Our objective is to determine the minimum $C(X)$ by equating $C'(X)$ to zero and solving for X. However, we introduce

$$f(X) = \frac{[S(X)]^2 C'(X)}{C_i}. \quad \text{Eq. 14.}$$

We shall solve the equation

$$f(X) = 0.$$

We see in Eq. 14. that the root of this last equation will be the root of $C'(X) = 0$. The function $f(X)$ is introduced because $f(X) = 0$ is easier to handle than $C'(X) = 0$. From Eq. 13. and Eq. 14., we obtain

$$f(X) = \frac{rDC_o}{C_i} S'(X) + [S(X)]^2\left[1 + \frac{1+r}{2r} S'(X)\right]. \quad \text{Eq. 15.}$$

To solve $f(X) = 0$ by Newton's method, we require

$$f'(X) = -\frac{rDC_o}{C_i} S''(X) + 2S(X)S'(X)\left[1 + \frac{1+r}{2r} S'(X)\right] + \frac{1+r}{2r}[S(X)]^2 S''(X). \quad \text{Eq. 16.}$$

This expression requires the derivatives of $S(X)$. We calculate from Eq. 10. and Eq. 11. that

$$S'(X) = \frac{dS(X)}{du}\frac{du}{dX}$$
$$= \phi'(u) + \Phi(u) + u\Phi'(u) - 1 - \frac{1}{2\sigma}\Phi'(u).$$

We recall that $\Phi'(u) = \phi(u)$ because the derivative of the accumulated probability function is the probability density. Also,

$$\phi'(u) = \frac{d}{du}\frac{1}{\sqrt{2\pi}}\exp(-u^2/2)$$
$$= -u\phi(u).$$

Hence,

$$S'(X) = \Phi(u) - 1 - \frac{1}{2\sigma}\phi(u). \quad \text{Eq. 17.}$$

Similarly, we obtain

$$S''(X) = \left[\phi(u) + \frac{1}{2\sigma} u\phi(u)\right]\frac{1}{\sigma}$$
$$= \left(\frac{1}{\sigma} + \frac{u}{2\sigma^2}\right)\phi(u).$$

We have enough formulas to solve $f(X) = 0$, and hence, $C'(X) = 0$, by Newton's method. To illustrate, we return to the example of section II. We have $p = \frac{1}{2}$, $r = .01$, $D = 4$, $C_o = \$5$, $C_i = \$2/365$, and from Eq. 7. and Eq. 12. we have $\mu = 84$, $\sigma = 4.334$. To solve $f(X) = 0$ we need a trial value of X. A good procedure is to use the results of section III to approximate the optimum X. This gives the trial value $X = 86.7$ obtained from Eq. 9. It will be convenient to convert to u by Eq. 10.; we obtain the trial value of u to be

$$u = \frac{86.7 + \frac{1}{2} - 84}{4.334}$$
$$= .7383.$$

We need $S(X)$, $S'(X)$, and $S''(X)$. From Eq. 11. and tables of the normal probability functions, we obtain for the trial value of u

$$S(X) = 4.334[.3038 + .7383(.7698) - .7383] + \tfrac{1}{2}(1 - .7698)$$
$$= .6952.$$

We calculate, using Eq. 17. and Eq. 18. that

$$S'(X) = .7698 - 1 - \frac{.3038}{8.668}$$
$$= -.2652,$$
$$S''(X) = \left(\frac{1}{4.334} + \frac{.7383}{2(4.334)^2}\right)(.3038)$$
$$= .07607.$$

Using Eq. 15., we calculate that

$$f(X) = -\frac{(.01)(4)(5)}{2/365}(-.2652)$$
$$+ (.6952)^2\left[1 + \frac{1.01}{.02}(-.2652)\right]$$
$$= 3.690.$$

Similarly, from Eq. 16. we obtain

$$f'(X) = 3.650.$$

Newton's method adjusts the trial value $X = 86.7$ to obtain

$$X - \frac{f(X)}{f'(X)}$$
$$= 86.7 - \frac{3.690}{3.650}$$
$$= 85.7.$$

To obtain the root of $f(X) = 0$ with greater accuracy, the calculations are repeated with the new trial value $X = 85.7$ in place of $X = 86.7$.

Suppose we accept $X = 85.7$, round off, and approximate the optimum X by

$$X = 86. \qquad \text{Eq. 19.}$$

To obtain Y we use Eq. 5., Eq. 10., and Eq. 11., obtaining,

$$Y = \frac{1 - .01 + .005}{.01} S(86)$$
$$= 99.5(.9000)$$
$$= 90. \qquad \text{Eq. 20.}$$

The solution is complete. We can see the error resulting from the normal approximation. We substitute Eq. 19. and Eq. 20. in Eq. 4. using the correct value of $S(X)$ given in Table 1. We find that the run-out percentage is 1.16 percent rather than the 1 percent desired. We can see by comparing Tables 1 and 3 that for values of X near the optimum value $X = 87$, $S'(X)$ in Table 3 underestimates the correct $S(X)$ given in Table 1 by roughly 20 percent. This indicates why the policy Eq. 19. and Eq. 20. produces a run-out percentage 16 percent greater than desired. If, for the demand of Table 1, we had used costs and a run-out fraction which led to an optimum policy with X less than 83, the normal approximation would have given an approximate solution with a run-out percentage less than assigned. This is due to the fact that when d is less than 83, $S'(d) > S(d)$. If the optimum policy had X equal to 83 or 84, the normal approximation would have practically no error. If we keep the same conditions of the illustrative problem except that we let r decrease below 1 percent, the relative error in the normal approximation would increase with r (until X became greater than 95).

The accuracy of the normal approximation depends upon how closely the distribution of lead time demand can be approximated by a normal distribution. In some real problems, the normal approximation is better than in the case of our artificial example, but, in many cases, the approximation is much worse. In some situations, it is wise to estimate X and Y two ways, once using the normal approximation and once the more accurate model of section VI. If the two results are practically the same in several instances, one might be led to assume that the demand is approximately normal.

The present analysis can be applied to a situation in which knowledge of the distribution of lead time demand is meager. To illustrate, suppose that there is not enough experience to permit the construction of a table like Table 1. It is felt that the lead time demand should average roughly 100 items. During a specific lead time the demand might occasionally be as low as 75 or as high as 125. It is even possible that in some rare situations the demand may lie outside the interval 75-125. However, it is inconceivable that the demand could be less than 50 or greater than 150. With such limited knowledge, one could assume that the expected lead time demand is $\mu = 100$. Furthermore, the range could be estimated by $150 - 50 = 100$. The assumption that the lead time demand is roughly normal leads one to estimate the standard deviation by one-sixth of the range.[2] Hence, one would use $\sigma = 100/6 = 16.7$. This is all that is required for use of the analysis of this section.

VI. SKEWED LEAD TIME DEMAND

We shall sharpen the analysis of section V in which the assumption of a normally distributed lead time demand led to inaccurate results. The reason for this inaccuracy has been discussed, and we have seen that in the numerical illustration the right-hand tail of the normal distribution does not extend far enough to the right. Furthermore, as we consider the calculations involved in the earlier sections of this paper, we recognize that in many situations it will be only the right-hand tail of the distribution of lead time demand that is used in the computations. Specifically, we shall use $S(X)$ for large values of X only.

These observations lead to the conclusion that we need a model of demand during lead time which accurately

[2] In many situations, a statistician can suggest other estimating procedures for the standard deviation.

approximates the right-hand tail of the distribution. The model can be inaccurate elsewhere. In this light, the authors have introduced the following procedure (3). Let us continue to speak in terms of the numerical illustration. In section V we used the normal approximation with expected value $\mu = 84$ and standard deviation $\sigma = 4.334$. Let us consider a normal distribution with expected value still 84, but whose standard deviation is $k\sigma = 4.334k$ with k a little greater than 1. The tail of this new distribution will extend farther to the right. We might hope that with a judicious choice of k, the new distribution would fit the empirical data in the right-hand tail. In (3), the authors have developed a method for selecting k. We shall not repeat that analysis here. But reference to the earlier paper leads to the choice of

$$k = 1.17.$$

Hence, we consider the normal distribution with $\mu = 84$, and standard deviation

$$\sigma = 4.334(1.17)$$
$$= 5.071.$$

The normal approximation to the distribution of lead time demand with $\mu = 84$ and $\sigma = 5.071$ is given in

TABLE 4

Normal Approximation with Augmented Standard Deviation

d	$P''(d)$	d	$P''(d)$	d	$P''(d)$
0–76	.070	84	.078	91	.030
77	.030	85	.077	92	.023
78	.039	86	.073	93	.016
79	.048	87	.066	94	.012
80	.058	88	.058	95	.007
81	.066	89	.048	96	.005
82	.073	90	.039	$97 - \infty$	.007
83	.077				

Table 4. Comparison with Tables 1 and 3 shows that the approximation of Table 4 is much better in the right-hand tail than the approximation of Table 3. The fact that the distribution of Table 4 is much worse in the left-hand tail is of no concern.

If the analysis of section V is repeated with $\sigma = 5.071$, rather than 4.334, we approximate the optimum policy by

$$X = 87,$$
$$Y = 85.$$

This policy produces an expected run-out of 0.925 percent. This run-out percentage is too low with a relative error of 7.5 percent. This result should be compared with the solution of section V in which the run-out percentage is too high with a relative error of 16 percent.

We shall not repeat in this article the analysis of (3) which leads to the value $k = 1.17$. However, we shall outline the nature of the analysis. The skewness of the lead time demand is computed as the third central moment divided by the cube of the standard deviation. This skewness brings to light the long right-hand tail. Then (3) considers the problem of fitting the lead time demand with a Gram-Charlier series consisting of two non-zero terms determined by the expected value, the variance, and the skewness. A normal fit to the right-hand tail of this Gram-Charlier series is determined through the introduction of $k\sigma$ as used in this article.

VII. A GENERAL CASE

Many inventory problems are in the following form and can be handled in the following manner. The expected value, standard deviation, and third moment of the daily demand can be estimated from experience. Also, the expected value, standard deviation, and skewness of the lead time can be estimated from experience. From these parameters, one can estimate the expected value, standard deviation, and third moment of the lead time demand by the method of (3). The multiplier, k, employed in section VI, can be determined by the method of (3). Then one can approximate the optimum inventory policy as was done in sections V and VI.

VIII. THE CASE OF LARGE RUN-OUT

We have estimated the average stock level to be the arithmetic mean of the expected high and low levels. However, if run-out fraction is large, this is inaccurate. If, say, the run-out fraction is 10 percent, the stock level will be non-zero, roughly 90 percent of the time. One is led to replace $C_2(X, Y)$ in section II by $.9C_2(X, Y)$.

IX. VARIABLE CUSTOMER ORDER SIZE

It has been assumed that each customer order is for a single item. Suppose that the number of items in a single customer order has the expected value E, the variance V, and the third central moment μ_3. A "critical" order reduces the stock level from a value greater than X to a value less than or equal to X. Let x be X less the stock level after the critical order is filled (we ignore the possibility that an order be greater than the stock level when that level exceeds X). We must add the expected value $E(x)$ and variance $V(x)$ of x to the expected value and variance of the lead time demand. We have

$$E(x) = \frac{V}{2E} + \frac{E}{2},$$

$$V(x) = \frac{\mu_3}{3E} + \frac{V}{2} + \frac{E^2}{12} - \frac{V^2}{4E^2}.$$

To indicate the derivation of these results, we let $P(s)$ be the probability density of customer order sizes. We assume that the probability density of the size t of the critical order is $tP(t)/E$. We assume that the conditional probability density of x, given t, is $1/t$. Then the joint probability density of t and x is $P(t)/E$. From this density function, the expected value and variance of x are derived by standard computations. These derivations are omitted because they require techniques of mathematical statistics which we do not wish to assume on the part of the reader.

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An Analytic Solution to the Least Cost Testing Sequence Problem[1]

by **L. G. MITTEN**

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IN (1) PRICE describes the "least cost testing sequence" problem. The problem may be briefly stated as follows:

An item is to be subjected to n different tests—say tests a (length), b (hardness), c (diameter), $\cdots$. Associated with the j^{th} test are two constants—C_j, the cost per item of conducting the j^{th} test, and R_j the probability of rejecting the item on the j^{th} test. The tests are independent in the sense that they may be run in any order whatsoever; the constants C_j and R_j are taken to be independent of the order in which the tests are run. For some particular choice for the sequence of tests, say $\boldsymbol{S} = \{a, b, \cdots, p\}$, the rule is established that an item is subjected to each test in the sequence in turn as long as the tests accept the item; if the item is rejected by a test, no further tests in the sequence are performed. An expected cost criterion function is proposed and has the form[2]

$$C(\boldsymbol{S}) = \sum_{j \in \boldsymbol{S}} C_j \prod_{i<j} (1 - R_i) \qquad \text{Eq. 1.}$$

Price proposes that the sequence which minimizes $C(\boldsymbol{S})$ be found by total enumeration of the $n!$ possible test sequences. As will be seen, the problem has an extremely simple analytic solution.

ANALYTIC SOLUTION

The following procedure yields the least cost testing sequence:

1. For each test j, compute the ratio C_j/R_j;
2. Run the test with the smallest value for the above ratio first, the one with the second smallest ratio second, $\cdots$, and the test with the largest ratio last.

As an illustrative example, we use the data given by Price in (1).

Test	R_j	C_j	C_j/R_j	Optimal Order of Tests
Visual	.002	.08	40	5
Shock	.05	.584	11.68	4
Electrical	.05	.232	4.64	3
Distortion	.035	.124	3.54	2
Vibration	.65	.64	.985	1

PROOF

Let $\boldsymbol{S} = \{a, b, \cdots, i, j, \cdots, p\}$ be any test sequence different from a sequence given by the foregoing procedure. In particular assume $C_i/R_i > C_j/R_j$ (such tests i and j must exist or the sequence $\boldsymbol{S}$ will be identical with a sequence given by the foregoing procedure). Now consider the sequence $\boldsymbol{S}' = \{a, b, \cdots, j, i, \cdots, p\}$ obtained from $\boldsymbol{S}$ by transposing the order of tests i and j. Then it follows directly that[3]

$$\begin{aligned} C(\boldsymbol{S}) - (C\boldsymbol{S}') &= \left[C_i \prod_{r<i} (1 - R_r) + C_j(1 - R_i) \prod_{r<i} (1 - R_r)\right] \\ &\quad - \left[C_j \prod_{r<i} (1 - R_r) + C_i(1 - R_j) \prod_{r<i} (1 - R_r)\right] \\ &= \left[\prod_{r<i} (1 - R_r)\right](C_iR_j - C_jR_i) \qquad \text{Eq. 2.} \end{aligned}$$

But

$$\prod_{r<i} (1 - R_r) > 0$$

(except in the trivial case where some $R_r = 1$) and $C_iR_j - C_jR_i > 0$ (since $C_i/R_i > C_j/R_j$ by hypothesis). Therefore, $C(\boldsymbol{S}) > C(\boldsymbol{S}')$. By a series of transpositions of adjacent elements (each adjacent pair having the properties of tests i and j in $\boldsymbol{S}$) we may finally obtain a sequence given by the procedure of the preceding section. Since each such transposition yields a smaller expected cost, the final sequence is optimal.

REFERENCE

(1) Price, H. Walter, "Least-Cost Testing Sequence," *Journal of Industrial Engineering*, July-August 1959.

[1] *Editor's Note:* Several readers have submitted material similar to the above, including Spencer B. Smith (Raytheon Manufacturing Company), Morton Klein (Columbia University), R. E. Beckwith and B. B. Winter (Aeronutronic, A Division of Ford Motor Company), and others. The Mitten material has been accepted for publication due to receipt priority. It should be mentioned that other investigators have also published material similar to the above, including J. Sacks (Columbia University) and S. M. Johnson (The Rand Corporation).

[2] The notation $i < j$ means "i precedes j in the given sequence S," with $\prod_{i<j}(1 - R_i) \equiv 1$ if j is the first element of S.

[3] We take $r < i$ to mean "r precedes i in S."

On Obtaining Consistency in Application of Predetermined Time Systems

by CLARENCE W. FREDERICK

Chief Industrial Engineer, Molded Case Circuit Breaker Division, Square D Company

HISTORICALLY, many systems and procedures have been designed to promote consistency in rating and stopwatch techniques. These systems and procedures were established in an attempt to achieve more accurate and consistent labor standards.

The introduction of predetermined time systems, such as Work Factor, Methods-Time-Measurement, etc., may have mistakenly tended to negate or minimize the importance of discovering new, or using established, ways to obtain greater consistency in time standards. It has, perhaps, been presumed that consistency in labor standards is being achieved automatically by the use of a predetermined system.

REASONS FOR INCONSISTENT STANDARDS

Inconsistency in newly established labor standards, even by the use of a predetermined time system, can be caused by a number of reasons. Some of these are:

1. Inexperience of the analyst.
2. The tendency to stray or vary from the motion and classification theories as conceived by the designers of the system being used.
3. Errors or faulty interpretations in application of the motion classifications, such as positions, apply pressures, assembly tables, etc.
4. Attempts to interpret motion classifications in the light of the production that the analyst expects the particular operator to achieve.

In addition, it is still as true with predetermined time systems, as it has been with stop-watch methods, that a major contribution to inconsistent standards is the human inability to determine, in an absolute sense, the "one best method." To illustrate this point, a group of engineers can be assigned the task of independently determining the "one best method" to be used for a selected job. It is almost a foregone conclusion that all of the engineers will not submit the same solution. Similarly, inadequate or erroneous statistical studies of non-cyclical elements and cyclical occurrences will tend to reduce the accuracy of the standard being established. This type of data plays a very important and integral part in the establishment of the labor standard.

WEEKLY MEETINGS

At the Square D Company, it has been found that a series of weekly meetings, held to discuss the theory and application of the predetermined time system used, showed the greatest promise of promoting consistent labor standards. In fact, it is felt that the success of the program for better time standards stemmed principally from the results obtained from these meetings. These meetings are held for two hours each week. Because of the importance of the work it is not expected that the series of meetings will be terminated at any future date and are, therefore, conducted on a continuing basis.

The general areas of study include a detailed review of the theory of the predetermined time system, definitions, and practical examples for study and practice (laboratory sessions). Day-to-day operating problems, other than those involved in the theory and application of the predetermined time system, have no place in a meeting of this kind and are therefore not considered for discussion. We felt that an extended discussion of the theory of each motion classification and a detailed examination of definitions were essential at the outset to form a basis for the work that followed. As a result, the first 25 or so meetings were spent in these areas of study. (The extent of the discussion of theory is somewhat dependent upon the previous knowledge and experience of the practitioners in the class.)

From this foundation, the next activity of the group was concerned with application of the theory just studied. Each participant was expected to bring to the meeting a timestudy completed during the previous week on a selected operation or job in the shop. He was expected to be ready to defend his results as well as discuss his reasons for assigning the particular motion classifications that were used.

This review and discussion of the examples, together with reasons for establishing particular motion classifications, did more to further the learning process than any other means used to date. In addition, a mathematical measure of the effectivenesss of the previous sessions on theory could be established by measuring the dispersion found in the group of time standards established independently by each member of the class. This measure was computed in percent of the expected or "true" standard.

It was soon discovered, however, that the procedure of requiring each member of the group to establish a standard on the same operation in the factory was not adequate. Too many times the discussion and review were

directed toward variations in opinions about the "one best method" and not about the study of theory and application of the predetermined time system. In addition, the dispersion computed to determine the progress of the class was being inflated by these differences in method.

USE OF FILMED EXAMPLES

Henceforth, factory operations that were to be used for practice studies were selected and then photographed using 16mm film. The film was then presented to the group and each member individually established a time standard in class for the method being presented. Distances, tolerances, etc., and other necessary data were made available to the group since these facts could not readily be determined by observation of the movie.

The use of film tended to reduce discussions about the differences in methods and allowed a more accurate determination of the differences between the studies of various engineers since the methods studied were now the same. In addition, this technique allowed the instructor to easily select examples which showed particular motions that the group had been studying and with which the group was having trouble.

At least one session per month is now being devoted to a review of the theory of particular motion classifications. The need for these review sessions is determined from the discussions of the practice studies of the previous weeks or from the day-to-day problems that might arise. In addition, the need is also dependent upon the extent of change of the participants due to advancement, reassignment, additions, separations, and upon the length of time elapsed since the last study of these classifications.

ADDITIONAL ADVANTAGES

These meetings have also produced other important side effects. For example, changes in procedures have been occasionally recommended. The use of a separate job instruction sheet was eliminated and the Motion Summary Sheet was substituted. The job instruction sheet was formerly used for the purpose of describing the method of operation to be used by the operator. The latter form was used only to summarize the various study elements required for the establishment of a particular time standard. Now, with proper added notations, it serves both purposes.

Also, a listing of particular motion classifications to be used whenever certain motions, or a series of motions, occur was compiled. For example, by reference to the list, the movement of the hand to a hopper of parts will now be assigned the same motion classification by all engineers.

CLOSE SUPERVISION

In addition to the formal training and practice just described, it was considered essential that each standards engineer be closely supervised for an extended period of time. In the writer's opinion, it is doubtful that one can closely supervise the work of more than five engineers and still have consistent and uniform time standards in a plant using a predetermined time system.

Each study is being given careful scrutiny by the Standards Supervisor to insure conformance to the established practices of the predetermined time system. The review also includes an examination of the methods used to obtain the necessary frequency data, a check of the mathematics of the study, and an analysis of its application to the particular operation being studied. After each engineer has proven his competency in the application of the predetermined time system, the supervisor will only spot check his work.

STANDARD DATA

This paper would not be complete without recognizing older established methods of obtaining consistent labor standards. One of the most important of these is, of course, the use of standard data. Standard data can be defined as the technique of grouping, graphing, classifying, etc., elements of similar operations in such a way that a "family" of time standards can be determined. This family of standards is established in relation to a set of variables that are inherent in the operation being studied, such as length or width of the parts, distances, etc. In this way, very few individual studies need to be made for the total series of operations.

Another advantage is that consistency between the various similar operations is achieved since the time values used were applied from only one, or a few studies. However, it will also be admitted that inaccuracy may still be a problem since an error introduced in the original study or studies would be applied to all of the operations to which the particular data were applied.

CONCLUSION

The combination of close supervision and the regular study and practice of the predetermined time system should result in the establishment of better and more uniform time standards. The added expense of these procedures is nominal but will be far outweighed by the resultant advantages of consistent earnings and employee acceptance.

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Long Range Planning

INTELLIGENT action based upon sound decisions is dependent upon the collection and keen analysis of all the facts pertaining to a particular problem. Many of these facts are the result of a look into the "crystal ball" of the future as interpreted by our Long Range Planning Committee, the organization charged with the responsibility of anticipating future problems and taking the necessary action to do something about it.

The Long Range Planning Committee was hatched in a smoke filled hotel room late one night in early 1955 by Don Malcolm, present Chairman of the Committee, and Chuck Lake, then Director of Industrial Engineering at R. R. Donnelley in Chicago. They both felt that something needed to be done to lift the standards of the profession, to get at the functions of Industrial Engineering, to define the term "Industrial Engineering," and to generally raise the standards of the profession. This concern led them to invite a number of leaders in the Industrial Engineering profession to a short meeting held during the national convention in St. Louis in May of 1955. At this meeting a number of opinions were voiced on the problems facing the Industrial Engineering profession and suggested remedies for these problems. The following specific suggestions did come out of this meeting:

1. The AIIE should develop a definition of Industrial Engineering consistent with the definition of Engineering.
2. This group should meet again for two days in the Fall of that year at Cornell to explore the subject further.

Thus was born the first of the Industrial Engineering Symposia, which have been the primary contribution of the Long Range Planning Committee over the past five years. The Cornell Symposium developed the definition of Industrial Engineering which was later adopted by the AIIE as its official definition. This definition has since been widely published and quoted and is one of the best known definitions in the entire Engineering field.

The success of the Cornell Symposium led to the subsequent holding of a Symposium each fall on the campus of a leading university. The outputs of these Symposia are summarized below:

1. *Purdue Symposium*—The group was primarily concerned with communicating an understanding of the Industrial Engineering definition developed the year before. As a result, four expository paragraphs were developed, each one aimed at explaining what an Industrial Engineer is and what he does. Each of the four paragraphs were written in terms which would mean most to people in the following groups—management, employees in industry, engineers and other staff groups, and the general public.
2. *Georgia Tech Symposium*—A question had been raised concerning the meaning of "system" and "systems design" as understood and used in the formal definition of Industrial Engineering. As a result of this, the Georgia Tech Symposium was concerned with further defining Industrial Engineering by the presentation of case studies that would particularly depict the dynamics of systems design. These case histories were intended to illustrate the design process in Industrial Engineering, the growing attention to systems problems, the relationship of Industrial Engineering to other branches of Engineering, how Industrial Engineering must be co-ordinated with other staff activities, and how it operates as an internal consulting function. The case histories were entitled: A Study of an Airlines Reservations System (Warren Alberts, United Airlines), Design of a Synthetic Detergent Production and Distribution System (Richard Forberg, Procter & Gamble), The Mechanization of a Fin-

ishing Operation (George Gustat, Eastman Kodak), and Organization for Systems Design (L. T. Ohmart, Armstrong Cork Company).

3. *Iowa Symposium*—The results of this Symposium were a flow-chart illustrating the Industrial Engineering process, a statement of the key areas where the profession can make its greatest contribution, and a statement of the tools and techniques used in the Industrial Engineering process.

The Northwestern Symposium has just recently been completed. This Symposium followed a somewhat different pattern this year from Symposia of previous years. Alex Rathe and Hal Davidson, respectively, led excellent discussions on—

"The Relation of Industrial Engineering in Management" and "The Requisite Skills of the Industrial Engineer."

However, after the first day the group felt it was plowing old ground in these discussions . . . that there was a more or less general agreement on what the composite modern Industrial Engineer is and what Industrial Engineering can do for management. What they felt lacking was any significant progress in getting the real message of Industrial Engineering, what it can do and what are its current successful applications as a function, over to the management world.

In short, it was felt that the *Image* of Industrial Engineering, as a profession and particularly as an organizational function, is very much in need of improvement. To say that this is a public relations job is one way of looking at it, and perhaps an accurate one, if one includes all of the institutional options that should be vigorously exploited in delivering the Industrial Engineering message. The group felt that Industrial Engineering, as a growing thriving function, is in danger unless a positive, comprehensive public relations program is developed. Perhaps the problem can best be brought out by stating two questions that were raised:

1. How long has it been since you have picked up a magazine like *Harvard Business Review, Business Week, Fortune,* or any other magazines that management reads and have found an article on "How Company X Uses Industrial Engineering," or "Industrial Engineering is contributing to the success of our company by being given these management missions to perform?"
2. How many companies have set up Industrial Engineering departments along the lines of United Air Lines or Procter and Gamble? If such functions aren't being created regularly, the message of their success isn't having an impact, at least not one identified as Industrial Engineering. The problem of growth-or-die may well face Industrial Engineering in this area of being "designers" of systems for management. Without proper "channel" time in management's attention span, we may lose out to more communicative professions.

It is realized that the problems are being stated quite vigorously, and I am ignoring many of the fine achievements that have been made. However, I am certain you will bear with the group in their role of focusing on problems—not dwelling on successes. The Symposia can best serve AIIE by such frank, hair-letting-down, evaluative sessions.

THE IMAGE AT THE ACADEMIC LEVEL

The group further felt that the Image of the Industrial Engineer at the academic level is excellent. The progress which has been made in designing curricula that prepare the Industrial Engineer for the kind of problems he will encounter 10 to 15 years after graduation is most satisfactory. There is no real problem here. Rather, a problem will exist in providing satisfactory job opportunities for the graduates of these schools.

THE IMAGE AS DEVELOPED IN THE *JOURNAL*

The *Journal,* in its editorial policy and content, is making Industrial Engineering acceptable in the modern technical engineering world. However, again here it appears that we are not publishing articles that can be used to influence management—our primary customer. It was felt that our current policy is necessary to insure the technical quality and professional gains that have been made. This policy should be continued. Perhaps what is needed is another periodical slanted towards management. In this regard, a proposition by a new publisher was reviewed. Bob Lehrer will have more to say in this regard.

THE IMAGE CREATED BY AIIE PROFESSIONAL RELATIONS PROGRAM

Our program in Professional Relations is exemplary—we are now a respected *working* member of the Engineering family. Little more needs to be said in this regard except to reinforce the thought that a program in Public Relations, directed toward getting our image properly conveyed to the Management World, that is as successful as our Professional Relations program, is urgently needed.

The Symposium drafted a resolution and some recommendations to AIIE for its consideration for focusing its management efforts. This resolution is still in the first draft as reported to me by Chairman Don Malcolm; and even though it will be further polished up, I felt it was of such timeliness and significance that it should be quoted here.

The Northwestern Symposium on Industrial Engineering expressed concern over the Image of Industrial Engineering, both as a profession and particularly as an organizational function, in the minds of Industrial Engineers, other Engineers and particularly in Management. Past Symposia have recognized and reported on the concept of the "Modern Industrial Engineer" as the designer of "systems" for management and have outlined opportunities for the "emerging role of Industrial Engineering."

It is the opinion of the Northwestern Symposium that this Image, or *any* image, is not being communicated adequately to the management world in particular. This problem is of sufficient importance that a program of necessary and comprehensive scope be developed and promulgated as quickly as possible. This program should be of a long range and continuing nature, directed toward creating an awareness and understanding of the modern Industrial Engineering Function. The following specific recommendations are offered as guide lines in structuring the program.

These are broken down roughly into Public Relations and Professional Development items.

Public Relations

1. Definitive articles (case histories) describing the successes of Industrial Engineering in companies should be developed and placed in leading management periodicals such as *Harvard Business Review, Fortune, Business Week,* etc. Articles by presidents and vice presidents of such companies as Argus, United Air Lines, Kodak, Procter and Gamble, International Minerals, etc., are illustrative of what is meant.
2. Study the desirability of having a 50th Anniversary celebration of the Amos Tuck Conference on Management or Gantt's 100th birthday in 1961 as a means of showing the modern Industrial Engineer. If desirable, an early start is needed to build an effective program.
3. More national control of the *content* of national convention programs. This should take the form of specific delegation of authority and responsibility to appropriate national officer or employee.
4. The possibility of two annual national meetings should be explored. AIIE has not had a national meeting in or around Chicago or New York in four years.
5. New Industrial Engineering publications directed in part toward the management world should be initiated. There are many forms this can take. The Editor of the *Journal* should develop plans in this direction.
6. The AIIE executive secretary can be quite influential in regard to an effective public relations program. He should be aware of public relations methods and experienced in how to develop effective programs.
7. A study group should be set up to explore the criteria for defining the proper (and AIIE recommended) use of Industrial Engineering as an organizational function. This is a very difficult subject to explore. Encouragement of the proper use of the term organizationally will enhance the image. The group felt that AIIE should direct its attention toward the developing, identifying and promoting of Industrial Engineering in terms of the individual professional engineer. In the long run, Industrial Engineering depends upon successful *individual Industrial Engineers* for its success.

Professional Development

1. Develop programs illustrating the professional Industrial Engineer at the chapter level. Develop workshops for Chief Industrial Engineers; build on their strength.
2. Focus attention on the individual as a problem-solver for management problems in the planning, review and control areas of management.
3. Bring the work of other professions in the management area to the professional attention of Industrial Engineers.

From the above resolution it is evident that the Symposium was concerned about the urgency of the public relation's problem. This concern will result in activity by the Board of Trustees in an effort to solve the problem.

It is hoped that from this brief description of the most recent Symposium it has been possible to obtain some insight to the operations and importance of this vital part of our Institute.

How to get new ideas on Materials Handling and Packaging

These dynamic fields change so fast that new ideas are often out of date before they get into print. Yet, if your firm is to stay competitive, you must be aware of the latest concepts.

One realistic way to keep abreast is to participate in the Industrial Management Center's 2-week courses in Materials Handling and Packaging. These work sessions provide practical training in *new* techniques, *new* methods of analysis, and in installing worthwhile cost reduction programs. Either course will revitalize your firm's efforts in that field.

These courses are effective. In 6 years, 230 men from 170 manufacturing, transportation, and retail firms in 15 countries have participated. Many send responsible top personnel every year.

Enrollment is limited. Personnel must be qualified for advanced training.

7TH ANNUAL TRAINING COURSE
JUNE 12 TO JUNE 23, 1960
LAKE PLACID CLUB
LAKE PLACID, NEW YORK

Write for 20-page brochure.

The INDUSTRIAL MANAGEMENT CENTER

James R. Bright, Director — 56-J Robbins Rd., Lexington, Mass.

Institute Interests

CALENDAR

March 24: One-day seminar will be held at the Roger Smith Hotel, Waterbury, Connecticut. This seminar will be sponsored by one of the newer chapters of AIIE, the Naugatuck Valley Chapter. The theme is "Selling Yourself and Your Ideas to Your Superiors." Write: Mr. Harold W. Hasko, United States Rubber Company, Naugatuck Footwear Plant, Naugatuck, Connecticut.

April 4-7: 1960 Nuclear Congress, The Coliseum, New York, New York. Write: Dr. Clarke Williams, Chairman of the Nuclear Engineering Department of the Brookhaven National Laboratory, Upton, New York.

April 19-21: National Conference of the Armed Forces Management Association, Biltmore Hotel, Atlanta, Georgia. Write: Armed Forces Management Association, National Headquarters, Room 3d121, The Pentagon, Washington 25, D. C.; or General Management Associates, 881 Peachtree Building, Suite 210, Atlanta 9, Georgia.

April 21-28: American Society of Tool Engineers 1960 Tool Show and Annual Convention, Artillery Armory, 15000 W. 8 Mile Road, Detroit, Michigan. (Technical Sessions—Sheraton-Cadillac Hotel, Detroit, Michigan.) Write: Harry E. Conrad, Executive Secretary ASTE, 10700 Puritan Avenue, Detroit 38, Michigan.

April 7-8: Annual Joint West Coast TIMS-ORSA Regional Meeting will be held at the U. S. Naval Postgraduate School, Monterey, California. The meeting is sponsored jointly by the Northern and Southern California Chapters of the Institute of Management Sciences and the Western Section of the Operations Research Society of America. Write: Ernest Koenigsberg, Touche, Ross, Bailey & Smart, 100 Bush Street, San Francisco 4, California.

April 25: Ninth Annual Spring Conference of the Cleveland Chapter of AIIE will be held in the new modern Cleveland Engineering and Scientific Center in Cleveland, Ohio, from 9 A.M. to 9 P.M. The Conference theme is "Are You Clued In?" For information write: Mr. C. M. Bednar, Chairman, Promotion and Publicity, Square D Company, 4500 Lee Road, Cleveland 28, Ohio.

1960 CENSUS

The 1960 Population Census will be conducted as of April 1. Every fourth household will be asked to answer the question "What kind of work was he doing?" for each person 14 years of age or older.

In order that the statistics on scientific and engineering manpower be developed as accurately as possible, the Census Bureau has asked that we pass along to our readers a reminder that this question on occupation should be answered completely and precisely. The entry should consist of at least two words in most cases.

Some examples of acceptable entries are:

Fire prevention engineer
Industrial engineer
Mechanical engineer
Motion-study engineer

CALUMET CHAPTER

A dinner meeting, September 8 at Wilson's Restaurant, Gary, Indiana, served as the "Kickoff" for the Calumet Chapter's 1959-60 business year. Speaker Jack F. Jerico, First Vice President, AIIE, spoke of "New Concepts of Industrial Engineering," with a detailed analysis of the new concepts as interpreted at college level and in industry today.

The Calumet Chapter's October Dinner meeting was hosted by George Diamond's Restaurant, Hammond, Indiana. Mr. H. C. Nickels, an investment counselor, spoke on "Investment Objectives and Securities to Meet Them." This was an informative and entertaining evening.

A special methods project undertaken by Calumet Chapter representatives was recently completed and received local appreciation and plaudits.

Involved was a small manufacturing plant conducted by Smith Memorial Industries, an outlet for the efforts of handicapped (blind primarily) people in Gary, Indiana. The industry, though small, offers employment to the blind in making such marketable items as mops, ironing board covers, small rugs, blue jeans, denim shopping bags, etc. The basic problem, as it evolved, stemmed from extremely overcrowded conditions of the shop. This was alleviated considerably by a reorganized, orderly layout, including improved storage. In this connection, one fixed and one mobile storage rack were designed and built, and two spool spindles devised to store and feed yarn and cover material onto a layout table.

Several minor innovations were integrated into the overall package of recommendations which were, incidentally, accepted by the Smith Memorial Industries supervision and the Board of Directors. As of this writing, approximately 85% of the recommended program has been installed.

As a result of AIIE study and recommendations, the Board of Directors of Smith Memorial Industries began a Calumet area promotional program to attract more customers for Smith products. This has taken the form of photographic newspaper coverage (Chicago *Sun-Times*, Gary *Post Tribune*, several local weeklies) and radio coverage (WGRY, WWCA—Gary, Indiana). In addition liaison between the Industry and various civic organizations has provided the AIIE with desirable publicity.

Upon AIIE recommendation that the Industry, as now operated, requires more space, the Board of Directors has placed on its agenda a plan to eventually underwrite expansion and/or relocation of present facilities.

Besides providing an interesting project for the AIIE members who participated, this study and recommendations were warmly received by the people served.

The Board Members and new officers of the Calumet Chapter conducted their first Fall business meeting, September 29, 1959 at Cressmoor Country Club. New officers include: President, Lew Rose, U. S. Steel, Gary; Vice President, James Freeland, U. S. Steel, National Tube Co., Gary; Treasurer, Ed Semplinski, U. S. Steel, Sheet & Tin, Gary; Corresponding Secretary, Duane Saylor, U. S. Steel, Gary; Recording Secretary, Louis Vidal, Youngstown Sheet & Tube, Indiana Harbor. The Board of Directors includes Harry McCabe, U. S. Steel National Tube Co., Gary; George Smith, Budd Co., Gary; Vern Droege, Youngstown Sheet & Tube, Indiana Harbor; Richard Fissinger, U. S. Steel, Gary; Frank Kelly, U. S. Steel, Gary; Henry Maurer, U. S. Steel, Sheet & Tin, Gary; Gerald Jones, Inland Steel, Indiana Harbor; Melvin Peterson, U. S. Steel, Sheet & Tin, Gary; Phillip Cochran, American Bridge Co., Gary.

LOUISVILLE CHAPTER

Our closing program for the preceding fiscal year was a Ladies' Night, held on May 20, and consisted of a Plant Tour of Spald-

ing Laundry and Dry Cleaning Co., Inc. This was one of the largest in attendance of all meetings last year, and was thoroughly enjoyed by all who attended.

The new business year of 1959-60 began with a chapter meeting on September 16th at the Jeffersonville Dining Room, followed by a tour of the Colgate-Palmolive Jeffersonville Plant in Indiana. A good turn-out of sixty-one members, wives, and guests found this tour most interesting, especially from the automation viewpoint.

METROPOLITAN NEW JERSEY CHAPTER

The September meeting, which was held at the Essex House in Newark, featured Henry H. Eskay, Vice President of Conmar Products Corporation, as main speaker. Mr. Eskay's talk, entitled "Crucial Problems Posed By Automation," covered the relationships between labor and management as they are affected by increased automation. Especially important was his discussion of the organizational impact of white collar automation, and the part the Industrial Engineer must play in the new technology.

Lamont M. La Robardier, Manager of Procedural and Organizational Research at Curtiss-Wright Corp., gave the program at our October meeting. His subject was "Setting Machine Time Standards for Minimum Cost." By the practical use of the minimum-cost chart Mr. La Robardier discussed an approximate or simplified method as well as an exact method to determine lowest cost cutting speeds for a given set of conditions. This new technique provides a scientific approach to the problems of cutting speed introduced by modern materials and methods. Mr. La Robardier is an active chapter member of our own Metropolitan New Jersey Chapter and a member of the Board of Governors 1957-1959.

SAVANNAH CHAPTER

The Savannah Chapter of the American Institute of Industrial Engineers has recently completed a study of the Chatham County Public Schools. This study was made at the request of the Board of Education. Its purpose was to assist the board in evaluating the nonacademic operation of the "plant" and to determine areas of improvement. Some of the major areas studied included pupil transportation, vehicle maintenance, purchasing, and custodial services.

The following is an excerpt from the letter of appreciation received by the chapter from the superintendent of education.

"I would like to express to you . . . our appreciation for the report on investigation of school plant operation in the Chatham County Public School System. This was a service to the school system and to the public. I think it was a fine thing for the members of your Committee and for the association you represent to donate to the Board of Education the amount of time and effort required to make this study.

Already, certain of the recommendations incorporated in your report have been implemented in our operation, I feel sure that this survey will continue to be of valuable assistance to us."

The First chapter meeting of the year was held in September at the Savannah Sugar Refinery. A well conducted plant tour was followed by a buffet supper and a business meeting. Many of the members had their first opportunity to view the processing of this very familiar product.

Mr. Louis Hagood of the U.S. Corps of Engineers was the guest speaker at the October meeting. Mr. Hagood's topic was the engineering problems involved in constructing underground combat centers. These centers will be used to control the defense of the North American continent in the event of air or missile attack.

SPRINGFIELD, MASSACHUSETTS, CHAPTER

The Springfield Chapter No. 94 was born last March. This event became a reality after a brief but rapid moving prelude of six months. The forming of a chapter to serve the Western part of Massachusetts was conceived by a group of Industrial Engineers, employed at Springfield Armory, Springfield, Massachusetts, who arranged an organizational meeting in October 1958.

The organizational drive, kindled by a message delivered by George H. Martin, President of the Boston Chapter, was spearheaded by Benjamin F. Ridall of Springfield Armory, interim and Charter President, and James E. Johnson, Chapman Valve Mfg. Co., interim vice president. During the winter months, the interim officers and committees kept the gears churning. Their efforts were rewarded by receiving a charter in March 1959 and by having a roster of 38 charter members.

In addition to the organizational effort, a regular monthly program was instituted under the direction of the vice president and program chairman, Jim Johnson. An excellent job was done. The November meeting was addressed by Martin Doring of Rath & Strong who spoke on "Industrial Engineering and Its Place in Industry." The December meeting was highlighted by a most interesting talk on "Value Analysis" given by Dusty Fowlkes of the General Electric Co. In January, the first dinner meeting was held and followed by an enlightening discussion on "Factors to be Considered in the Selection of In-process Materials Handling Equipment" presented by Marshall Scheider of Walworth & Co.

Mr. James Duncan, President of Work Factor Company, made the February dinner meeting a most satisfying one by speaking on "Production Planning and Inventory Control." The March dinner meeting was a full evening during which the Chapter Constitution was accepted by the membership; and George Martin, President of the Boston Chapter spoke on "The Advantages of Predetermined Time Systems." The April meeting was a joyous one. At this meeting the acceptance of our group as a Chapter of AIIE was announced, and election of officers was conducted. Our guest speaker, although congratulatory, did not share in our elation of the announcement. "Union's Attitude Towards Industrial Engineers" was the subject of Mr. Norman Eiger's talk. Mr. Eiger is Regional Educational Director of International Lady Garment Workers Union AFL-CIO, and editor of the District Union Newspaper. There was no bloodshed after his talk.

Ladies' Night, held in May, was the climax of the season's calendar. A social hour and dinner preceded the meeting. Mr. William Vallette, Vice President of Northeast Region AIIE formally presented the Chapter's charter and installed the new officers for the 1959-60 season. They were: President, James E. Johnson, Chapman Valve Mfg. Co.; Vice President, Louis Pieri, Buxton Inc.; Secretary, James E. Dowd, John Breck Inc.; Treasurer, Robert C. Bisbee, American Bosch Div., American Bosch Arma Corp. Several hours of dancing followed.

The 1959-60 season opened on Oct. 14. The high program standard established during our first season was met by having Douglas H. Anderson, Manager of Special Products Division, Exec-U-Phone Systems Inc., Boston, Mass., speak on the problems of timely and accurate data-gathering and timekeeping and describing modern techniques available for solving these problems. The November meeting was one that will be remembered for a long time by those of us who attended. This meeting was a joint meeting with the Boston Chapter held in Boston. We were host to our esteemed AIIE National President Frank J. Johnson. The programs for the remaining six meetings have been planned, and an interesting season is ahead of us.

We wish to extend our thanks to our "big brother" chapters for their welcome and assistance and to extend our welcome to our "baby brother" chapters who received their charters since March 1959.

ST. LOUIS CHAPTER

The St. Louis Chapter of the American Institute of Industrial Engineers started off the 1959-60 year with a new idea and every indication of having an extremely successful year. The first meeting was a "pre-season warm-up meeting" held on August 19th at the famous Barth Estate in St. Louis County. Approximately 50 persons attended the festivities, which included swimming, ping-pong, "old yarns" and a picnic supper on the porch.

The September meeting was the first of our dinner-speaker meetings, and we were fortunate in having Dean Don Fischer of the Washington University School of Engineering speak on "The Crisis in Engineering." Dean Fischer spoke of the abrupt downturn in engineering enrollment, which began with an 11% drop in 1958 and which will probably drop some more in 1959. He said that this downward trend is hitting the nation just when the demand for engineers is getting greater and greater each year as a result of automation and advanced technology. The drop in enrollment also has an immediate effect on the engineering schools, since the smaller tuition income results in unbalanced budgets and the cutting of necessary cost items such as laboratories. Dean Fischer said that there has been an effort made to determine the cause of the downturn, however there doesn't appear to be any one or even several reasons which can be directly pointed out as being the answer. One thing he did mention, was that engineers, and many times successful engineers in high positions, don't do enough to counter the propaganda that pours forth labeling the engineers as being "uncultured persons" in an age of humanities. Dean Fischer went on to say that he felt that culture does not come from an added number of liberal arts courses, but rather from the taking of so-called humanities courses which are geared to the needs of a group. He cited the successful engineering course of "Human Relations in Industry" as being the type of courses that are needed. It was truly an interesting meeting.

WINSTON-SALEM CHAPTER

For our April meeting, Mr. Donald S. Holmes, Logician in the Operations Research and Synthesis Section of the Large Steam Turbine Generator Department of General Electric Company at Albany, New York, spoke on "Horse Kicks and Quality Control." He covered the probability theory leading to the Poisson probability function and its use in quality control and applied statistics. Election of officers for the new year also took place at this meeting. They are: President, Clarence M. Dunlap, Jr.; Vice President, Fred T. Carter; Secretary, Milton R. Sweatman; Treasurer, Robert A. McLean. Directors for this year are: Millard W. Hodge, Hal G. Worley, Harold H. Mathews, Edgar A. Aldridge, Charles T. Johnston, and Marshall G. Bryant.

In May the Annual Ladies' Night consisting of a banquet and dance culminated the 1958-1959 season.

A meeting of Officers and Directors was held in August to approve the 1959-1960 budget and appoint committees.

YOUNGSTOWN CHAPTER

At our September meeting Mr. Renfrew, representative of IBM Corporation, gave an interesting talk on computers and their use in the Industrial Engineering and manufacturing fields. He explained the different types of computers and their varied applications. The main topic of discussion centered on the potential purchaser's inability to communicate with IBM representatives on common ground, a situation primarily due to the layman's lack of fundamental knowledge of computers.

The October meeting took the form of a "One Most Pressing Question Forum." The meeting was aimed at finding an answer to the one most pressing problem of each Industrial Engineer. Everyone wrote down his chosen question and dropped it in the fish bowl as he entered the meeting room. The chairman picked questions at random from the bowl and read each question to the group. This group therapy type of program was quite a success for different members shared their combined knowledge and practical experiences as each question arose.

BOARD OF TRUSTEES' MEETING

Biltmore Hotel
Atlanta, Georgia
Session I, Friday Evening, October 16, 1959
Session II, Saturday Morning, October 17, 1959

The Board of Trustees of AIIE is the official governing body of your organization. This group meets to conduct business for you twice a year. The official minutes of the October Board of Trustees' Meeting are published in the JOURNAL to keep you informed of AIIE activity.

The meeting was called to order by President Johnson at 8:45 P.M. October 16, 1959. Among those in attendance were: Frank J. Johnson, President; Jack F. Jericho, First Vice President; Floyd J. Titler, Executive Secretary; Ralph W. Updegraff, Treasurer; George H. Gustat, Past President; William J. Vallette, Vice President, Region I; Leroy O. Gillette, Vice President, Region II; Charles G. Howard, Vice President, Region III; John A. Nattress, Vice President, Region IV; James A. Richardson, Vice President, Region V; William N. Bryant, Vice President, Region VI; John L. Imhoff, Vice President, Region VII; Arthur E. Aronson, Vice President, Region VIII; Arthur L. Ziegelmeyer, Jr., Vice President, Region IX; Carl F. Kaiser, Vice President, Region X; Robert H. Roy, Board Member-at-Large; Warren E. Alberts, Board Member-at-Large; Alex W. Rathe, Board Member-at-Large; Howard P. Emerson, Former President; Frank F. Groseclose, Former Board Member-at-Large; Robert N. Lehrer, Editor-in-Chief, *The Journal of Industrial Engineering;* James T. French, Director of National Meetings; Henry M. Owades, Director of UEC Affairs, AIIE Professional Relations Committee; Daniel E. Mahaffey, President, Atlanta Chapter AIIE; and Don A. Trenwith, Business Administrator.

1. *Minutes, May 15, 1959 Board of Trustees' Meeting*—Mr. Gustat moved that the minutes of the May meeting be approved as presented. Motion seconded by Mr. Jericho. Motion passed.

2. OLD BUSINESS

2a. *United Engineering Center—Fund Raising Campaign*—Henry Owades, Director of UEC Affairs, reported on the progress of the campaign. The Institute had pledged approximately 71.5% of its quota. A written report was distributed. It contained two recommendations for bolstering the campaign.

1. A reinstitution of the close follow-up which the regional campaign managers (1958-59 Regional Vice Presidents) started last April.
2. A personal and close supervision of 13 specified chapters having unfulfilled pledges of $1,000.00 or more. This follow-up to be done under the coordination of the regional campaign managers, but by the respective 1959-60 Regional Vice Presidents. The Board concurred with these recommendations.

Mr. Owades listed 24 chapters that are now on the honor roll, having reached 100% of the quota assigned to them. These 24 chapters are:

Mid-Hudson	Evansville	Great Salt Lake
Rochester, N. Y.	Calumet	San Francisco-Oakland
Boston	Charleston-Huntington	Metropolitan New York
Central Connecticut	Toledo	Sacramento
York, Pennsylvania	Baton Rouge	Seattle
Nashville	Houston	Winston-Salem
Chattanooga	Oklahoma City	Lehigh Valley
Twin City	East Texas	
Mississippi Valley		

Mr. Owades listed the following chapters as having not yet submitted any report or indication that their campaign is underway:

Mohawk Valley	East Tennessee	St. Louis
Southwestern Connecticut	Memphis	Cleveland
	Middle Tennessee	Dayton
Worcester	Western North Carolina	Indianapolis
New Orleans		Stark County
Birmingham	Western Virginia	

The Board of Trustees' members will each add their own efforts when speaking to any of the chapters within the next few months. This campaign must be brought to a successful conclusion so that we may demonstrate to the other interested societies that the AIIE is contributing their share toward the UEC.

2b. *1960 Conference and Convention Report*—Mr. Updegraff reported on his correspondence with the 1960 Conference and Convention Committee regarding their proposed budget. An advance check in the amount of $400.00 has been forwarded to this committee. Mr. Updegraff has suggested some changes in their budgeting techniques and has communicated to them the instructions of the Executive Committee as passed at the September meeting.

Vice President Ziegelmeyer, as a member of the Conference and Convention Committee, reported that the entire budget was being studied and new material would be furnished to the Executive Committee prior to their November meeting.

The Executive Committee instructed Mr. James T. French, Director of National Meetings, to provide for more detail in the budgeting techniques in his proposed revision of the National Conference Manual. Mr. French was also directed to contact the Detroit Chapter (host for the 1961 conference) and instruct them to prepare a more detailed budget, following this proposed new pattern, ready for consideration by the Board of Trustees, at their May 1960 meeting.

Mr. Ziegelmeyer will arrange for a copy of the revised 1960 Conference and Convention Committee budget so that it may be reproduced by the National Headquarters office and distributed to all members of the Board of Trustees.

2c. *Journal Advertising Taskforce Report*—Dr. Lehrer, as Editor-in-Chief of the *Journal*, was asked to make a progress report to the Board on the study of the *Journal* advertising problem.

Dr. Lehrer reported that the taskforce had been staffed with Delmar W. Karger and Rogers Akers serving as co-chairmen, with Gordon Early, Jack Walker and Dr. Lehrer also serving.

This taskforce expects to have a proposal for the improvement of the *Journal* advertising available by January 1, 1960. Considerable effort has already been put into the study, but will require considerable more effort by the taskforce before a successful solution can be found.

2d. *ECPD Definition of Engineering*—Dr. Rathe reported that the proposed ECPD definition of engineering (first shown to the AIIE at the time of the May Board of Trustees' Meeting) is still under study. The Board, at that time, requested that the Long Range Planning Committee make a study of this proposed definition and send their recommendations to the Professional Relations Committee. The Professional Relations Committee has received these recommendations and is now circulating them to 29 members of the committee. After this study and a review of their recommendations by the Long Range Planning Committee, Dr. Rathe plans to submit the combined recommendations to the Board of Trustees for a mail ballot. The ballot should be ready for distribution to the members by December 1. The mail ballot will be necessary so that the final recommendations of the AIIE can be submitted to the ECPD by spring of 1960.

2e. *Unionization of Engineers*—President Johnson and Mr. Titler reviewed the background of AIIE's study of a policy that would demonstrate our position and thinking about the unionization of engineers. It was explained that the latest proposed draft of a policy statement had been submitted to Attorney Dargusch and that he made some revisions and recommended the statement which is now submitted. This draft was thoroughly discussed by the Board of Trustees.

President Johnson summarized what seemed to be the consensus of the Board and referred the recommended resolution back to the Professional Relations Committee. The Professional Relations Committee is to give further study to the several proposed statements.

To further clarify the results expected in this study, Mr. Alberts made the following motion: All files of the various proposed resolutions to be returned to the responsible taskforce of the Professional Relations Committee for consolidation to a more logical and meaningful statement of the AIIE's policy on unionization. Motion seconded by Mr. Jericho. Motion passed.

Dr. Rathe, as Chairman of the Professional Relations Committee, is to communicate to the taskforce the Board's appreciation of their efforts on this project and request that they continue their studies and carry on the work as mentioned above.

2f. *Other Old Business*

2f1. *Organization Study*—Mr. Jericho reviewed the previous proposal of the Organization Study Committee that was reviewed by the Executive Committee at their past meeting. Copies of the plan had been circulated to all the Board of Trustees' members at that time. Several suggestions for changes in the original plan had been accepted by the committee and incorporated into the report. The Board of Trustees discussed the entire plan and took the following action:

Mr. Gillette moved that the committee's recommended new organization be approved in principle, using the title of "Executive Director" instead of "Executive Vice President" for the new position to be created. Motion seconded by Dr. Rathe. Motion passed.

Mr. Jericho reported that with this action by the Board of Trustees, his committee would continue their study, and in conjunction with the Constitution Committee, make up a report on the necessary changes in the Constitution and the necessary changes in the AIIE job descriptions so that the plan might be implemented.

2f2. *Letter about Accreditation*—President Johnson read a letter referring back to previous correspondence with an engineering school regarding their request for permission to establish a student chapter. The problem involves the accreditation by ECPD in relation to (3) of Article IV, Section 3(A).

Col. Groseclose, the chairman of the committee previously asked to rule on this case, asked for clarification of category (3) saying that it was very difficult to resolve the problem without knowledge of what was meant by this provision.

To provide the committee with this information the Executive Secretary was asked to search headquarters files and to write to those individuals who originally proposed this provision which was an amendment to the Constitution.

3. NEW BUSINESS

3a. *Membership Report*—Mr. Titler reviewed the Membership Report as of October 1, 1959. The report shows at this time that there are 5,331 associate members, 2,880 members, 13 fellows, for a total of 8,244. As of this date there are 506 affiliates. On this date, there were 99 applications in the hands of the MQC. Since October 1, approximately half of these applications have been returned to National Headquarters, the remainder are in the hands of the new MQC in New Orleans. The Chairman of this new Membership Qualifications Committee is Mr. William E. Fourqurean. 165 applications were received by Headquarters during the month of September and 115 had been received at

National Headquarters during the first fifteen days of October.

3b. *New Chapter Report*—Mr. Titler reported that two chapters have been chartered since the time of the September Executive Committee Meeting. The new Senior Chapter is:

No. 101 Central Virginia Chapter, AIIE
N. H. Friedman, Vice President
P.O. Box 839
Lynchburg, Virginia

The following new Student Chapter has been chartered:

University of Minnesota Student Chapter
Douglas Norman, President
Mechanical Engineering Department
University of Minnesota
Minneapolis 14, Minnesota

Mr. Jericho stated that from his correspondence with the Vice Presidents of the Regions he has compiled a list of 34 proposed Senior Chapters in various stages of organization. Mr. Jericho was optimistic that many of these groups would be chartered during the coming few months.

Mr. Nattress, Vice President of Region IV, announced that the proposed Orlando Chapter was well underway and expected to approve their Constitution at a meeting on Tuesday, October 20.

3c. *Financial Report*—Mr. Updegraff presented the year end financial report and reviewed many of the items with the members of the Board.

Mr. Vallette moved the Treasurer's Report be accepted. Motion seconded by Dr. Rathe. Motion passed.

3d. *1959-60 Budget*—Mr. Updegraff presented the proposed budget as prepared by the Executive Secretary, Treasurer, and Chairman of the Long Range Financial Planning Committee. This proposed budget as amended by the Executive Committee at their September meeting was recommended to the Board of Trustees.

The Board discussed each item of the budget. Dr. Rathe voluntarily changed his request for expenses as a Board Member-at-Large, by reducing it $100.00. This $100.00 was subsequently added to the proposed allowance for the Vice President of Region IX.

The Board of Trustees accepted the 1959-60 budget by individual motions for each major breakdown of income and expense. The total budget for each classification, income and expense, will be $140,750.00. (Appendix 1—these minutes).

Dr. Rathe moved that with the approval of the $2,100.00 total expense allowance for the Presidential Committees, that the Board of Trustees give the Professional Relations Committee first consideration if any additional moneys become available for expenditure during the year. Motion seconded by Mr. Aronson. Motion passed.

With the approval of the budget, the meeting was recessed at 12:15 A.M. October 17th. President Johnson announced that the meeting would reconvene at 9:30 A.M. October 17 in the same room.

3e. *Engineering Management Conference*—Dr. Rathe reported that the early preliminary reports indicate this meeting was both technically and financially successful. A detailed report has been submitted to the Engineers Joint Council, but is not yet available for distribution.

Dr. Rathe moved in accordance with the recommendations of Mr. McNiece, AIIE's chief delegate to the Engineering Management Conference, that the AIIE take action to assume financial responsibility along with the other participating societies beginning in the year 1960. There was no second to the motion.

3f. *CIPM Membership*—Mr. Titler conveyed the recommendation of the Executive Committee made at the committee's September meeting recommending that the Board of Trustees take action to join the Council for International Progress in Management when the Board feels the necessary funds are available.

Dr. Lehrer and some of the members of the Board of Trustees raised questions about certain activities of the CIPM, their history, and present activities.

Mr. Alberts made a motion that the Board of Trustees take action to join the CIPM during this fiscal year. Motion seconded by Dr. Rathe. Motion did not pass.

Dr. Rathe moved that the AIIE take action to join the CIPM next October 1. Motion seconded by Mr. Vallette.

Mr. Updegraff moved that the Board table the above motion and ask the Director of International Relations to present statements in support of his recommendation that AIIE join CIPM. Motion seconded by Mr. Roy. Tabling motion passed 13 to 4. The motion is tabled for consideration at the May Board of Trustees' Meeting.

3g. *Other New Business*

3g1. *Classification of Industrial Engineering Positions by the Civil Service Commission*—Dr. Rathe reported that the Civil Service Commission has released a draft on the proposed new definitions of Industrial Engineering to be used by the Commission. The draft of the proposed change was received by the Professional Relations Committee on October 5. The draft is being duplicated and circulated to members of the Professional Relations Committee. When the Professional Relations Committee has reviewed this document and made their recommendations, the proposal will be circulated to the AIIE Board of Trustees for a mail vote.

3g2. *Requirements for AIIE Delegates to Engineers Joint Council*—Dr. Rathe presented a proposal that defines the requirements for the AIIE delegates to Engineers Joint Council. These requirements have been submitted by a committee composed of Robert S. Rice (Chairman), Dr. William J. Jaffe and Morley H. Mathewson.

Dr. Rathe moved that the Board of Trustees accept the recommendation of the committee preparing them that these requirements be established as policy to be used as a rule in appointing delegates to the Engineers Joint Council. Motion seconded by Mr. Vallette. Motion passed. (Appendix 2—these minutes.)

3g3. *Standards of Industrial Engineering Education*—Dr. Rathe reported that the taskforce working on this project was making better progress than had been expected and that a report could be expected the first of January.

3g4. *Publication of Conference Proceedings*—Dr. Lehrer, as Editor-in-Chief of the *Journal*, asked the Board to consider the re-establishment of a previous policy calling for the publication of the Proceedings of AIIE National Conferences as a regular issue of the *Journal of Industrial Engineering*. Dr. Lehrer stated that this was the only way he believed that a satisfactory financial position in publication of these proceedings could be attained. The recent experience of the Atlanta Conference Committee and the subsequent financial loss in the publication of these proceedings was considered.

Dr. Lehrer stated further that some price, probably about $4.50 to $5.00 per registrant should be paid by the Conference Committee toward the publication of the proceedings. The *Journal* staff would publish the proceedings as a *Journal* issue and distribute them in a paperbacked regular edition to all members and *Journal* subscribers of AIIE. Copies that would be sent to the Conference Committee could be hardbound for distribution to the registrants of the Convention. Additional copies in a hardbinding could be provided for future sale by the Conference Committee and/or the National Headquarters Office.

Mr. Jericho suggested that the Dallas Conference and Convention Committee be allowed to continue with any plans for the 1960 proceedings already too far advanced for change.

After further discussion, President Johnson asked Dr. Lehrer to immediately contact Chairman Dodson in Dallas and work out a plan for presentation to the November Executive Committee regarding the 1960 Conference Proceedings.

President Johnson appointed a committee for study of the permanent plans for future Conference Proceedings. This committee is to consist of Mr. James T. French, Director of National Meetings, Dr. Robert N. Lehrer, Editor-in-Chief of the *Journal of Industrial Engineering*, and Jack F. Jericho, First Vice President. The report of this committee is to reach all Board members for study before the Board Meeting in May 1960.

3g5. *Industrial Engineering Posters*—In response to several requests, brief consideration was given to the possible preparation of posters for distribution to high schools by Senior Chapters and Industrial Engineering Departments of our universities. These posters would be used to publicize Industrial Engineering education to high school students.

3g6. *Staff Reports*—Mr. Alberts suggested and the rest of the Board concurred, that too much time is being spent at Board of Trustees' meetings studying the detail of problems instead of sufficient staff work having been done by the interested parties in advance. The Board of Trustees therefore asks that all future recommendations to the Board be presented with complete details for consideration and that a summary be attached for immediate consideration. The Board further suggests that these recommendations should be distributed to the Board of Trustees' members well in advance so that each Board Member may have an opportunity to consider the details of the proposal prior to the meeting.

Adjournment—The meeting was adjourned at 12:30 P.M.

Next Meeting—The next meeting of the Board of Trustees will be held on Friday, May 13, 1960 at the Sheraton-Dallas Hotel. This meeting will be held in conjunction with the AIIE 1960 National Conference and Convention.

The next meeting of the Executive Committee will be held on Saturday, November 7, 1959 at the Bellevue-Stratford Hotel in Philadelphia, Pennsylvania. This meeting will be held in conjunction with the Second Annual AIIE Northeastern Region Conference and Convention.

Appendix 1

AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS, INC.
145 North High Street, Columbus 15, Ohio

BUDGET FOR FISCAL YEAR OCTOBER 1, 1959 TO SEPTEMBER 30, 1960

INCOME

1. *Dues*		
a. Member	$52,000.00	
b. Associate	52,000.00	
c. Affiliate	9,000.00	
d. Student	4,000.00	
e. Application Fees	7,000.00	
f. Member-at-Large Chapter Dues	2,000.00	
Total Dues		$126,000.00
2. *Publicity and Publications*		
a. Books	600.00	
b. Journal	10,000.00	
Total Publicity and Publications		10,600.00
3. *Miscellaneous*		
a. Insignia	50.00	
b. Certificates	50.00	
c. Supplies	250.00	
d. Interest	2,000.00	
e. Use of Mail List	1,300.00	
f. Unclassified	500.00	
Total Miscellaneous		4,150.00
TOTAL INCOME		$140,750.00

EXPENSE

1. *Administrative*		
a. Salaries	$47,247.00	
b. Communications	800.00	
c. Postage	5,500.00	
d. Applications	300.00	
e. Stationery	1,000.00	
f. Office Supplies	3,100.00	
g. Office Equipment	800.00	
h. Office Maintenance	450.00	
i. Bank Charges	200.00	
j. Audit	400.00	
k. Ballots	600.00	
l. Business Administrator Expenses	1,350.00	
Total Administrative		$ 61,747.00
2. *Occupancy*		
a. Rent	5,060.00	
b. Insurance	65.00	
Total Occupancy		5,125.00
3. *Publicity and Publications*		
a. Brochures	500.00	
b. Miscellaneous Printing	2,800.00	
c. Journal	35,340.00	
Total Publicity and Publications		38,640.00
4. *Officers and Committees*		
a. Officers	15,070.00	
b. Directors and Committees	4,970.00	
Total Officers, Directors and Committees		$ 20,040.00
5. *Miscellaneous*		
a. EJC Membership	1,500.00	
b. Budgeted Reserve	7,038.00	
c. Contingency Reserve	5,000.00	
d. Chapter Expansion	1,660.00	
Total Miscellaneous		15,198.00
TOTAL EXPENSE		$140,750.00

Appendix 2

REQUIREMENTS FOR AIIE DELEGATES TO ENGINEERS JOINT COUNCIL

Engineers Joint Council decisions can affect policies and practices of each of its constituent member societies. These decisions are developed and concluded by the discussions and votes of delegates appointed by each member society. Therefore, appraisal of selected delegates to represent the American Institute of Industrial Engineers should result in a satisfactory balance of the following specific requirements:

1. *Membership.* A delegate should be a fellow or member of active standing of the American Institute of Industrial Engineers. In addition, he shall have been a member for at least three years prior to appointment to the office of delegate.

2. *AIIE Knowledge and Experience.* A delegate must understand the structure, policies and operating practices of the AIIE national organization and of its chapters. It is preferred that a delegate should have served the national organization, or a chapter, as an officer or committee chairman.
3. *Related Knowledge and Experience.* A delegate should have knowledge and experience related to the work of the EJC committee or board to which he is appointed.
4. *Professional Standing.* A delegate should be (or have been in the case of retired delegates) engaged in a position or business activity that is comparable in level of attainment with those of other EJC delegates with whom he will associate. There should be some evidence that his professional associates recognize the delegate as having professional stature that is above the average.
5. *Character.* A delegate should have demonstrated in his AIIE activity, and in his work in the general field of Industrial Engineering, that he has a positive balance of values with regard to the following: dependability to discharge his responsibilities and commitments; creative talent to generate solutions of problems and ideas for progress; tact and diplomacy in dealing with people; initiative to fill the needs for leadership; and integrity to demonstrate the AIIE creed governing ethical practices.

THE ORGANIZATION OF CONTROLLERSHIP, by E. B. Cochran, *Journal of Industrial Engineering,* July-August, 1959.

Just a brief note to say that your staff did an excellent job in handling the printing of the material for my article on "The Organization of Controllership" in your July-August issue. I was also interested in the editorial comments preceding the article which brought out, I thought, rather clearly the close relationship between controllership functions and those which have been designated as "Industrial Engineering" for some period of time. There is considerable common ground, and it is only natural that there be interdepartmental controversies as mentioned by the commentator.

Having been mildly accused of taking a narrow view of Industrial Engineering, I would like to say something in my defense. What appears to be happening is that Industrial Engineering has won a far larger victory than even its strongest proponents yet realize. In effect, the controllership function represents an application of Industrial Engineering proposals and techniques through the medium of financial analyses and broad techniques of management control. I myself, for example, generally hire personnel with Industrial Engineering background and seldom look for people with extensive accounting experience. This inevitably restricts the Industrial Engineering Department proper to basic services of an analytical and control nature for the *manufacturing* organization, and it seems logical to continue to call this function "Industrial Engineering." The name used for the functions performed in the Controller's office (or in similar offices reporting directly to top management performing functional analyses of procedures and operations) may be "Operations Analysis," "Planning Office," "Control Section," etc. The point is that the analytical function has now come of age—owing a good bit to Industrial Engineering efforts—and the name of the department is more or less unimportant. As a practical matter the Controller's Office is coming to discharge these functions for a number of fairly cogent reasons, but in the process is losing its original accounting emphasis entirely. I have discussed this subject at more length in the article, "What Is a Controller," referred to by the article in the *Journal of Industrial Engineering.*

This entire subject of the development and expansion of analytical and control functions out of Industrial Engineering and up to the top levels of management has been of extreme interest to me, and I think a good bit needs to be clarified if sterile interdepartment controversies are to be avoided.—*E. B. Cochran, Budget Manager, Rohr Aircraft Corporation.*

SIMULATION AS A PRODUCTION AID, by John L. Colley, Jr., *Journal of Industrial Engineering,* July-August, 1959.

I have one question about the article entitled "Simulation as a Production Aid." Along about the middle of the first column on page 297 it is stated, "It was decided that since direct mathematical calculation of the probability that two parts chosen at random mating properly would be very difficult, simulation of the assembly by the Monte Carlo technique would be the most expeditious approach."

In view of the fact that normal distribution was assumed for each of the two mating parts, it seems to me that the mathematical calculation referred to is no more than a straight forward application of the propagation of error theory. The average difference between the two parts is the difference of the average dimensions, or .067 − .062 = .005. The standard deviation of this difference is the square of the sum of the squares of the individual standard deviations, which figures out to be .0026. Dividing .005 by .0026 gives 1.93 standard deviations, and the table of areas under the normal curve says that the probability of Part 2 being smaller than Part 1 is .0268. How much more expeditious can you get?

If the individual distributions had been skewed or otherwise non-normal, then the distribution of their differences would likewise have been distorted, but I think I am right in stating that the sum of difference of normal distributions is of itself a normal distribution.

If the foregoing comment is correct, this would seem to me an unfortunate application of simulation, for two reasons. First, it is considerably more trouble to simulate than to calculate. Secondly, the simulation process is subject to sampling errors not encountered in the analytical approach.

REFERENCE

(1) Duncan, Acheson J., *Quality Control and Industrial Statistics,* Richard D. Irwin, Inc., Homewood, Illinois, 1955, p. 72.
—*A. R. Burgess, Head, Department of Industrial Engineering, Agricultural and Mechanical College of Texas.*

AUTHOR'S COMMENTS

I appreciate Professor Burgess taking the time to write regarding my article "Simulation As A Production Aid."

Professor Burgess is correct in his statement that if the thickness of parts A and B are each normally distributed, the difference in size of pairs of A and B, drawn at random, will be normally distributed with mean equal to the difference between the means of

the individual parts and variance equal to the sum of the variances of the individual parts.

At the time I made this study eighteen months ago, I held a B.S. in Industrial Engineering and had completed a basic course in Statistics, a course in Quality Control, and a graduate course in Experimental Statistics for Engineers. I was not familiar with the above relationship at that time and used the simulation approach as described.

Perhaps in this instance I was typical of many thousands of Industrial Engineering graduates who left school with less statistical training than needed. Professor Burgess is correct that the direct calculation is much simpler, provided that is, that the person involved is familiar with the theory. The Monte Carlo process and its successful application, in this instance in a very unsophisticated manner did provide the solution, and it is felt that the results are none the less valid because a theoretical approach existed above the educational level of myself and probably other members of this society.

Again my thanks to Professor Burgess.—*John L. Colley, Department of Industrial Administration, School of Engineering, Yale University.*

Reading the recent article, "Simulation as a Production Aid," by Mr. John L. Colley, Jr., I had a problem that has been somewhat troublesome to me as a teacher displayed in our professional magazine. For far too many students, the powerful simulation techniques become an excuse for failing to think. "Monte Carlo exists, it can solve this problem, why learn other methods?"

As a result of this stimulus, I have prepared the following comments on this situation, together with an analytical solution to Mr. Colley's problem.

The old command to "practice what you preach" is as applicable to Industrial Engineers as it is to men in any other line of work and more so than to most. A large part of the work of the Industrial Engineer is not "doing" alone, but rather in getting others to "do" correctly and, particularly, in getting others to think in a specific way, to think in terms of motion economy, to think in terms of scientific and economic solutions to Industrial Engineering problems. To hope for any success in this direction, the Industrial Engineer must be as careful in his selection of the methods and techniques which he uses as he would like for others to be in their's. In part, it is the matter of setting an example, but, in larger part, it is being fully conscious yourself of the real meaning of these ways of thinking.

An example which has been driven home forcefully to the writer on several recent occasions is the misapplication of simulation or "Monte Carlo" techniques. It should be understood that this is not belittling simulation; it is a powerful tool when correctly used, but like all powerful tools, it presents a very great temptation for misapplication. A description of such a misapplication was published in the July-August 1959 issue of *The Journal of Industrial Engineering* in an article entitled "Simulation as a Production Aid."

In this paper, the problem presented in its simplest terms was that given two parts, A and B, which are produced by independent processes, each producing parts with independent, normal distributions, with known universe averages μ_a and μ_b, and known universe standard deviations, σ_a' and σ_b'; find the probability that, of a randomly drawn pair of parts, A will be smaller than B in the dimension of interest. With respect to this problem, Mr. Colley says, "It was decided that since direct mathematical calculation of the probability of two parts chosen at random mating properly would be very difficult, simulation of the assembly by a Monte Carlo technique would be the most expeditious approach." Basically, there is one fault with this statement, direct mathematical calculation of this probability is very simple. This reverses the expediency of using a simulation technique. Using Mr. Colley's values of $\mu_a = .057''$ and $\mu_b = .062''$ and $\sigma_a' = .001667''$ and $\sigma_b' = .002''$, it can be calculated as follows:

1. The expected difference between paired members of populations whose expected values are known is the difference between these expected values or $\mu_b - \mu_a = \mu_{b-a}$ (2, p. 568). Thus we would expect that the average difference between these two parts would be that part A would be smaller by $.062'' - .057''$ or $.005''$.

2. Since the universes of the parts are normally and independently distributed the distribution of the difference is normally distributed (3).

3. Since the two parts are independently manufactured and chosen, $\sigma_{b-a}'^2 = \sigma_b'^2 + \sigma_a'^2$ (2, p. 569). Then $\sigma_{b-a}'^2$ may be calculated as $(.002)^2 + (.001667)^2$ or $\sigma_{b-a}' = .0026038$.

4. Then the probability that part A is shorter than part B (the probability that the two randomly chosen parts will mate properly) is the probability that the difference between the two parts is less than the average by an amount less than the average in the unfavorable direction or the probability that the difference deviates from its mean by less than .005 or, normalizing, by less than .005/.0026 standard deviations or 1.92 standard deviations in the unfavorable direction. (All deviations in the other direction will still produce mating parts.)

5. Looking this value up in a table of normal areas(1), it is found that the probability of a good mating under the assumptions given in .9726 and, of course, the probability that they will fail to mate, if the original assumptions are true, is .0274.

The calculation of the solution by this method required eight minutes and no instruments other than a pencil and paper to yield an exact solution while simulation required, according to Mr. Colley, "less than half a day" using a desk calculator even when it was not carried on long enough to provide a close approximation to the value desired.

The simulation method is an excellent tool for use when mathematically exact solutions are not available or are inordinately cumbersome, but where there exists a convenient and direct mathematical solution, the use of prolonged simulation methods is much like driving tacks with a sledge hammer; the tool is sufficiently powerful, but the efficiency is somewhat low.

REFERENCES

(1) Burlington, R. S., and May, D. C., Jr., Handbook of Probability and Statistics with Tables, Handbook Publishers, Inc., Sandusky, Ohio, 1953.

(2) Duncan, Acheson J., *Quality Control and Industrial Statistics*, Richard D. Irwin, Inc., Homewood, Illinois, 1955.

(3) Hoel, Paul G., *Introduction to Mathematical Statistics*, John Wiley and Sons, Inc., New York, 1947, p. 64ff. (The reference is a proof that the mean of a sample from a normal universe is normally distributed, but a mean is simply a sum divided by a constant.)

—*Scott Tabor Page, Assistant Professor, School of Industrial Engineering and Management, Oklahoma State University.*

Now Available to AIIE Members

AIIE decals

Approximately 3½ inches in diameter

Cost $.50 for two (minimum order)

Order from: AIIE Headquarters
145 North High Street
Columbus 15, Ohio

Professional Relations

PROFESSIONAL RELATIONS ACTIVITIES

Commenting about the air of confusion which permeates the communications media regarding the spheres of interest of engineers, scientists and technicians, Dr. George B. Kistiakowsky, special assistant to the President for Science and Technology had the following to say: "With all due respect to the excellence of their (National Association of Science Writers) intentions, I cannot agree that science is either the cure of disease, the improvement of auto engines, or the production of new fertilizers. In fact, I may go a step further and state that neither is science the establishment of a station on the moon. All these practical accomplishments are notable triumphs of engineering and technology, but they are not science as such.

"To stress the difference between science and technology is not to imply value judgments, for each is equally necessary to our society. The danger is that through lack of understanding of the nature of scientific research and what it requires in order to flourish, we may fail to cultivate it adequately."[1]

The scientists are not alone in their plight of suffering from the lack of a clear public image. The image of the engineer isn't exactly in focus.

Being fully aware of the problem, the Public Relations Committee of the EJC is carrying on a quiet but intensive campaign to help clear some of the public confusion regarding the engineers' image. An article in an earlier issue of the *Journal* acquainted you with the details of this campaign. Briefly, it consists of a series of six (6) institutional type advertisements designed to sketch a simple statement of fact about engineers and engineering. The specific objective of this campaign is to overcome the lack of real understanding on the part of editors and writers as to just what an engineer is and just what an engineer does. The ads are appearing from time to time in the trade journals of the journalistic field.

This series of advertisements like the first series on behalf of the engineering profession will appear in *Editor and Publisher*, the business magazine of the newspaper profession. In one of the ads, Engineers Joint Council welcomes inquiry by editors, newspaper and television writers concerning the obscure phrases that may occur in description of engineering jobs. After all, says the ad, every occupation has its jargon, and why should the public understand the meaning of "creep and fatigue," an engineering phrase, any more than it would understand "killing widows," a newspaper editor's phrase.

If coverage is the main criterion of success, then judging by the following statistics success is assured.

"Quarter-page ads were scheduled in *Editor and Publisher*, placed to advantage on pages surrounded with appropriate editorial copy (one story on the missile program, another on the reporter's role in government) on June 20, August 29, September 26, October 24, November 21 and December 21. These ads are seen and read by 20,000 publishers, editors, reporters, radio newsmen and ad agency men, who control the news and much of the nation's written current material on newspapers and magazines. For instance, the ads reached 1413 newspapermen on 43 metropolitan dailies in the 12 largest cities; 1500 daily newspapers with circulations under 50,000; 786 executives of wire services and syndicates and 500 subscribing newsmen in Washington."[2]

The Public Relations Committee of EJC feels that the campaign is accomplishing its purpose, namely to set straight editors, newswriters, and ad agency copy writers on their understanding of engineers and engineering to the benefit of the engineering profession. See if you can see the difference in your favorite newspaper and magazines.

Prepared for Professional Relations Committee
By Harry L. Davis

[1] Extracted from the November, 1959 issue of *Engineer*.

[2] Extracted from "Report of EJC Public Relations Committee on The Public Service Advertising Program" by Arthur J. Fox, Jr.

One of a series

Just Who's Firing Those Missiles?

From the news stories you might think that Cape Canaveral is populated only by scientists and electronic brains. As a matter of fact, much of the design, construction and operation of our missiles and satellites is the work of engineers. Engineers don't want to take credit from the scientists, upon whose original research the missile program is based, but they do feel that the public should recognize engineering as a major force in the missile program.

Engineers Joint Council has been established by the engineering profession of the United States, to help you make the public properly aware of what the engineers are doing. For facts about engineers and the engineering profession, check with—

Engineers Joint Council
29 West 39th St., N. Y. 18, N. Y.
For information, call Pennsylvania 6-9220

One of a series

Creep? Fatigue?

Every occupation has its jargon. You, for instance, could baffle the man on the street with talk of "killing widows."

You avoid jargon. You don't print your own and you translate that of other professions or trades to make the news understandable to your reader.

Engineering has its jargon—just as medicine or any other profession. Maybe you haven't realized it before, but strong metals do "creep". And they do "fatigue."

Engineering's jargon is as readily translated as your own profession's. When you need help on an engineering story, consult—

Engineers Joint Council
29 West 39th St., N. Y. 18, N. Y.
For information, call Pennsylvania 6-9220

One of a series

The Big "W"

Who, what, when, where and why still belong somewhere in the news story. And who still leads the list.

Your theater columnists don't review plays without naming the actors. Your book reviewer names the author. Your whole staff is aware that names still make news.

Too often, engineering news events are reported as if they somehow, miraculously, got done, happened, evolved.

A bridge is built. A mine is opened. A process is developed. A product is perfected.

People, engineers, do all these things; they don't just happen. Engineers with names are the creative minds behind every engineered product and project you report. Use their names and make all those passive verbs active.

Engineers Joint Council
29 West 39th St., N. Y. 18, N. Y.
For information, call Pennsylvania 6-9220

recent readables

AUTOMATION

"Simple Mechanization Pays Off," J. E. Harbuck and F. J. Ramondini, MODERN MATERIALS HANDLING, *page 107, September, 1959.*

A basic approach to mechanizing job-lot assembly without spending a fortune is outlined in this article. The authors list the ten principles that guided their layout planning for gear motor assembly where production varied from steady production of few models to special job lot models. By providing a unique yet simple conveyor system that carries all types of assemblies to the common operations of painting, testing and packing, they have cut total cycle time 66 percent. (*N. E. Sparks, Ethyl Corporation*)

"Data Center for Automatic Production Control," MACHINE DESIGN, *page 29, July 23, 1959.*

Paper-and-pencil methods of production control—even those built around manual data-display boards—may soon be outdated by new automatic equipment. One front-runner in the race to automatize production data keeping is Productograph, an instant-tally system that reports and correlates work output and downtime of every machine in the shop.

"Better Decisions on Mechanizing," Gerald E. Johnson, FACTORY, *page 62, July 1959.*

When a mechanization project doesn't pay off, what's wrong? Chances are, somebody flubbed on dollars. Here are practical tips on practical cost figuring. (*B. M. Bryant, Ethyl Corporation*)

COST CONTROL

"Pinpointing Soft Spots in Costs," Donald Hoodes, FACTORY, *page 68, April, 1959.*

Do big-money figures mystify you? Then break them into little pieces. You'll find opportunities for pinpointing soft spots in costs.

GENERAL

"The Creative Engineer, Part 1—Personality Trait" Eugene Raudsepp, MACHINE DESIGN, *page 22, May 28, 1959.*

Why do some engineers frequently have "brainstorms" while others seldom even have "good ideas"?

To answer this question, the author has surveyed experts on creativity across the nation. Engineering and research managers, professors, philosophers, psychologists, social scientists, consultants —all working with creative people—have provided information. This three-part series identifies—for the first time anywhere—thirty major attributes of the creative engineer.

"The Creative Engineer—Part 2—Intellectual Abilities," Eugene Raudsepp, MACHINE DESIGN, *page 28, June 11, 1959.*

The thirty attributes discussed in this three-part series of articles are of value to everyone concerned with the creative process. The engineer, through understanding the basic characteristics of creativity, can consciously develop those characteristics he does not already sufficiently possess. The interviewer charged with hiring creative personnel can use the thirty as a nucleus for intelligent

questions to evaluate the potential of each technical applicant. The manager will find them an aid in understanding creative people and an aid in fostering an atmosphere conducive to creative work.

"The Creative Engineer—Part 3—Mechanics of Creativity," Eugene Raudsepp, MACHINE DESIGN, *page 27, June 25, 1959.*

Eight such techniques for creativity uncovered in a survey of experts are reported in this concluding article.

"Patent Fundamentals," D. W. Karger, MACHINE DESIGN, *August 20, 1959.*

Ideas are not inventions, Neither are patents. Ideas are the prelude to invention and are the tools of the inventor. They are not patentable. Patents are merely the legal documents that describe claim inventions. Here is a basic guide to what the company and engineer should know about handling ideas, inventions and patents.

"Parke Davis' Cure for Truck Breakdowns," M. Berko, MODERN MATERIALS HANDLING, *page 122, September 1959.*

Dividing maintenance responsibilities for battery-powered industrial trucks among various crafts presented a most difficult scheduling problem at Parke Davis, and it was repair rather than preventive work. By setting up a preventive maintenance shop with scheduled inspection based on installed engine hour meters, Parke Davis have solved craft scheduling problems, reduced equipment downtime and pinpointed specific equipment whose abnormally high maintenance cost should prohibit its continued use. (*N. E. Sparks, Ethyl Corporation*)

"Statistics Show Human Side of Maintenance," CHEMICAL WEEK, *page 125, August 29, 1959.*

A new look at the human factors of maintenance—the evaluation of attitudes and work habits from a currently-in-progress study by the Aero Medical Laboratory of Wright Air Development Center (Dayton). The study shows that worker skill isn't quite the sole determining factor as long as supposed. (*J. M. Barksdale, Ethyl Corporation*)

"The Organization Theory of Henry Gantt," Arthur Svenson, ADVANCED MANAGEMENT, *page 16, August 1959.*

Though management's role grows increasingly more complex, the basic tenets evolved four decades ago by one of the pioneers of scientific management still apply today.

"Characteristics and Organization of the Oral Technical Report," GENERAL MOTORS ENGINEERING JOURNAL, *page 74, April, 1959.*

The oral technical report is becoming more popular as a means of communicating information within industry on a variety of subjects. Its effectiveness depends to a large extent on the delivery qualities of the speaker. To be effective it must be presented on a level the audience is able to comprehend. Proper organization is vital for an oral technical report. A checklist has been devised by General Motors Institute that summarizes the important points to remember in preparing and presenting the oral report. (*J. M. Barksdale, Ethyl Corporation*)

"Job Description for Executives," John K. Hemphill, HARVARD BUSINESS REVIEW, *page 55, October 1959.*

Many companies are dissatisfied with the conventional methods of analyzing executive jobs. Here is a new approach that measures managerial responsibilities in terms of ten dimensions, for purposes of selection, assignment, and promotion.

INVENTORY CONTROL

"Automatic Control of Warehouse Flow," R. W. Roop, MATERIALS HANDLING ENGINEERING, *page 64, October, 1959.*

To operate a warehouse automatically requires step by step mechanization of each functional operation. According to Mr. Roop, automatic control is now economical for many aspects of warehouse operation. For others, the time is coming. He tells how automatic carton readers, diverters and palletizers can bring labor reductions on handling at the end of conveyor lines. Roop also discusses the application to distribution warehouse and to transfer warehouses. (*N. E. Sparks, Ethyl Corporation*)

"Fastest Warehousing You Ever Saw," FACTORY, *page 68, July, 1959.*

Within minutes this new automatic warehousing system at Reliance Electric & Engineering Company gets an order on its way. It's a brand-new approach to storage and order picking. Key to the system is the Retriever that rushes motors into or out of storage. Benefits? Three big ones:

50% more usable storage space.

Orders go much faster.

Just one man (and four units) can do the whole job. (*B. M. Bryant, Ethyl Corporation*)

MATERIALS HANDLING

"Automatic Container Filling," by the Editors, MATERIALS HANDLING ENGINEERING, *page 74, October, 1959.*

How do you handle many products in a variety of containers on an assembly line? Magnolia Petroleum Company at its Beaumont, Texas refinery has built a Blending and Packaging Plant designed to avoid double handling and double payroll. On its conveyorized assembly line, a high degree of automation is achieved in drum filling and handling. (*N. E. Sparks, Ethyl Corporation*)

"Planning a Handling System" by L. M. Polentz and Dr. R. R. O'Neil, MATERIALS HANDLING ENGINEERING, *page 67, October, 1959.*

Difficult problems in the development of the atomic bomb were solved with the Monte Carlo method. Now the authors describe how this same technique can be used to predict accurately how long a new cycle of operations will take by using data from previous time studies. It is also used to tell how much waiting time there will be between operations. (*N. E. Sparks, Ethyl Corporation*)

"Selection and Use of Pneumatic Conveyors," by H. S. Sayre, MATERIALS HANDLING ENGINEERING, *page 66, September, 1959.*

The fifth in a series of articles furnishing technical information on all types of conveyors. It describes how pneumatic conveying can bring increased productivity, time saving, and lower labor costs for a variety of materials ranging in densities from 75 to 250 pounds per cu. ft. and in type from large metal parts to wood chips. (*N. E. Sparks, Ethyl Corporation*)

"Plan Buildings for Handling," by Editors, MATERIALS HANDLING ENGINEERING, *page 71, September 1959.*

This article gives several examples of how designing buildings for materials handling has resulted in convenience to customers, adequate handling for high-production, and elimination of manual labor. (*N. E. Sparks, Ethyl Corporation*)

"Gravity Flow: Biggest Problem of Bulk Material Users," by Paul O. Berg, MODERN MATERIALS HANDLING, *page 117, September, 1959.*

In Part I of a three-part series, author Berg relates how bin unloaders and flow aids can give continuous and uniform flow of bulk materials. Specific devices are described which eliminate hopper banging and material hang up for a wide range of animal, vegetable and mineral materials of every conceivable size, shape, consistency, liquid-content and form. (*N. E. Sparks, Ethyl Corporation*)

"Are Wooden Pallets on the Way Out?", by Gordon C. Thomas,

Packing Editor, MODERN MATERIALS HANDLING, *page 104, September, 1959.*

W. H. Sardo, Jr., of the National Wooden Pallet Manufacturers Association answers this question in the negative in an interview with editor Thomas. He points out that the new low return rate granted by carriers on empty pallets, and the pallet pool (brought on by standardization of pallet size range) have recently shifted emphasis away from palletless handling, expendable pallets and new pallet materials and have reemphasized wooden pallets. (*N. E. Sparks, Ethyl Corporation*)

"Handling with Hoists," by Editors, MATERIALS HANDLING ENGINEERING, *page 74, September, 1959.*

Each type of hoist must be regarded in relation to a specific job. This article mentions purchase price, cost of operating the hoist, cost of man hours saved or lost by its use, and the cost of maintenance as all being part of the real cost of a hoist. Eight rules to follow in hoist selection are treated individually. (*N. E. Sparks, Ethyl Corporation*)

"Using Statistics to Analyze Materials Handling Problems," W. J. Richardson, MECHANICAL ENGINEERING, *page 54, May 1959.*

Certain basic concepts of statistical analysis are extremely useful when applied to materials handling: how to collect and classify data, how to construct a frequency distribution, and to apply sampling techniques to everyday materials handling. (*B. M. Bryant, Ethyl Corporation*)

OPERATIONS RESEARCH

"Turning Minor Changes into Major Savings," CHEMICAL WEEK, *page 75, October 24, 1959.*

This article reviews a technique that permits the plant operator to run process improvement "experiments" without tampering with the product or production.

The technique is known as EVOP—Evolutionary Operation. It can be made a permanent part of operating procedure because it doesn't upset product quality and yield. And, it doesn't add to plant costs or require the assistance of technical personnel from research or development departments. The technique has been applied successfully by several large chemical companies. (*J. M. Barksdale, Ethyl Corporation*)

QUALITY CONTROL

"Quality Control Program Gages Production of Consumer Goods," IRON AGE, *page 82, August 27, 1959.*

High-speed production of consumer goods requires a practical program of quality control.

This down-to-earth program in a powermower plant looks at the final product from the customer's viewpoint.

SYSTEMS AND PROCEDURES

"There's No Mystery to Designing Forms for Automatic Systems," Ray Marier, THE OFFICE, *page 130, October 1959.*

This is an answer to the growing myth that needs to be corrected before it is accepted as a truism, the canard that forms design for automatic data processing belongs in a class by itself.

"The Best Ways to Coordinate a New Procedure," Leslie H. Matthies, THE OFFICE, *page 79, October 1959.*

To coordinate a procedure between several departments, the systems man must work with great care and finesse. Recoordination is even a tougher task.

WORK MEASUREMENT

"An Inexpensive Method of Work Sampling," C. B. Gambrell, Jr., J. W. Barney, THE OFFICE, *page 82, October 1959.*

Describes a technique of automatic work sampling through the use of a camera with a constant speed drive an automatic timer to actuate the camera at random intervals.

"The Truth About Wage and Work Measurement Today," FACTORY, *page 74, April 1959.*

This is the survey you've been waiting for. It will tell you how management men in 785 plants see these controversial tools—how they use them—what the gains (and pitfalls) are—what's needed to make them work better.

"Making Incentives Work," Frances Torbet, HARVARD BUSINESS REVIEW, *page 81, October 1959.*

Once heralded as a panacea for all labor-management problems, the effectiveness of individual piecework is threatened by technological change. But group incentive plans can still help employers achieve better worker participation and productivity.

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UNITED STATES BORAX & CHEMICAL CORPORATION invites highly qualified engineers with a minimum of five years' experience to become associated with a newly organized function.

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The I.E. Opportunities service is a functional committee activity of the AIIE. Information concerning employment opportunities is collected on a nationwide basis and is provided without charge to members upon request. The committee is composed of members from the Columbus, Ohio chapter.

SERVICES PROVIDED

Current job openings are published in condensed form in each issue.

In addition, a monthly I. E. Opportunities Bulletin is supplied to over one hundred chapters located throughout the United States.

Each job opening is assigned a **"P"** number for identification. The name and address of the person to contact for additional information concerning a specific job opening is sent to members on request.

EMPLOYERS

Employers having openings for qualified Industrial Engineers are invited to list them. Government agencies and educational institutions as well as business and industry are urged to take advantage of this free service.

Industrial Engineers are often employed in such fields as Work Measurement, Production Control, Plant Engineering, Operations Research, Industrial Relations, Sales, and Management. For a more complete coverage, see the following list of job classifications. Please do not hesitate to forward information on jobs in any area where it is recognized that an Industrial Engineering background will be of value.

To list your job openings with the Opportunities Service, send all or part of the following information with the name of your contact man to the address below: Type of industry, location, job classifications, minimum educational and experience qualifications, and salary range.

This information will be publicized to the members in condensed form in the JOURNAL and in monthly chapter Bulletins. Company names are not shown.

MEMBERS SEEKING JOB OPPORTUNITIES

The following list shows job openings available just prior to press time. If you would like more information about one or more of the positions listed, mail the **"P"** numbers with your name and address to the Opportunities Service at the address below. The Service will advise you by return mail of the name and address of the person to contact for further information, or advise you if the position is no longer available. Your name will not be forwarded to the company with the job opening.

For more current listings, contact your local Chapter Secretary or Opportunities Chairman for the latest monthly Bulletin.

ADDRESS OF THE SERVICE

I. E. OPPORTUNITIES SERVICE
American Institute of Industrial Engineers
145 North High Street
Columbus 15, Ohio

INDUSTRIAL ENGINEERING OPPORTUNITIES

Position number	Industry, location		Travel?	Job classification number (See key)	Salary range $1,000	Qualifications required		
						Years of exp.	Age range	Remarks
41	Consulting	Ohio	X	10, 21, 31		5–7		
167	Weapons Systems	Wash. D.C.		50				Ph.D.
213	Air Force	Calif.		15, 32, 42, 43, 44, 53	7.5–	2+	21–	Repair & Modification
273	Air Force	Utah		11, 13, 18, 42, 43, 44, 53	6.3– 7.5	2–		I.E. Degree
279	Air Line	Ill., Colo., Calif.		11, 13, 18, 41–43, 50–52, 70	5.0– 8.5	1–6		
308	Automotive	Pa.		19, 31, 36, 38, 45, 53, 71	6.6– 9.6	4–6		
339	Automotive	Pa.		10, 22, 23, 32, 33, 36 38, 42, 45, 71	6.6– 9.6	4–6		
340	Automotive	Pa.		11, 13, 22 23, 32	5.4– 7.8	0–2		
376	Education	Mass.					35–	
419	Food Processing	Ill.		14, 15, 16, 22, 36, 38, 91	7.2– 9.0	5–8	30–38	I.E. or M.E. Degree
423	Air Force	Ohio		Broad	8.8			I.E. Degree
424	Air Force	Ohio		Broad	4.5– 7.5			I.E. Degree
447	Synthetic Fibers	W.Va.		10, 20, 30, 91	Open	3–5		I.E. Degree
449	Electronics	Mass.		30, 50, 70	6.0– 8.0	1–5		
461	Paper	Ohio	Ltd.	10, 20	9.0–13.0	3–5	–45	Tech. Deg. Req.
464	Consulting	N.J.	X	10, 20, 32–34, 42, 43, 54, 71–73, 92	8.0–12.0	5–	30–36	I.E. Degree
465	Consulting	Mass.	X	10, 20, 30, 40, 60, 71, 92	11.0–15.0	10–	35–95	I.E. Degree or Equiv.
470	Mining & Smelt .	N.M.		11, 13, 26, 36, 42, 45	5.0–7.0		–45	I.E. Degree Preferred
471	Plastic Prod.	Va.		10	10.0–12.0	5–	30–45	MTM Experience
472	Plastic Prod.	Va.		11	8.0– 8.5	1–2	–30	MTM Experience (Woodworking)
473	Electronics	Iowa		19, 30, 40, 50	7.2–	0–10		B.S. or M.S. Degree
474	Food Processing	Ill.		14, 15, 16, 22, 36, 38, 91	5.8– 9.0	0–8	25–35	I.E. or M.E. Degree
475	Printing	N.Y.		11, 42, 44, 46		2–5	24–30	College Grad.
476	Metalworking	Ohio		13, 15, 36, 37	7.0–	2–5	25–30	
477	Metalworking	Ohio		53		2–5	25–30	
479	Brass Products	Conn.		10, 20, 36		1–5		Math. Experience
483	Chemical	Tenn.		10, 30, 53	5.5–	1–5	22–30	I.E. Degree Preferred
486	Printing & Publishing	Calif.		18, 32, 36, 55	10.0–15.0		30–40	MBA Desirable
487	Electronics	Tex.		11, 16, 30, 32, 36	6.0–8.5	1–5	24–35	I.E. Degree
489	Refining	Tex.			10.0–12.0	10–15		Exp. in Crude Oil Act.
491	Airline	Ill., Colo., Calif.	15%	11, 13, 18, 51, 70	5.0– 8.0	1–5	–40	I.E. Degree Pref.
493	Plumbing Supplies	Ohio		11, 13, 18	7.5– 9.0	7–	30–35	I.E. Degree
494	Electronics	Utah		10–18, 34, 36, 40–46, 91	7.5– 9.0	5–10	30–40	I.E. Degree
495	Education	Fla.		Asst. Professor	Open	5–	30–	M.S. or Ph.D. Pref.

Position number	Industry, location		Travel?	Job classification number (See key)	Salary range $1,000	Qualifications required		
						Years of exp.	Age range	Remarks
496	Air Force	Calif.		10, 11, 13, 15, 42-44, 70, 71	8.8-			I.E. Degree
497	Air Force	Calif.		10, 11, 13, 15, 42-44, 70, 71	7.5-			I.E. Degree
498	Air Force	Calif.		10, 11, 13, 15, 42-44, 70, 71	6.2-			I.E. Degree
499	Electronic Equip.	N.Y.		10, 36	Open	3-		I.E. Degree or Equiv.
503	Electronics	D.C.		30	9.1-11.7	5-		I.E. Degree
504	Synthetic Fibers	N.C.		10, 20, 32-36, 42, 43, 50, 53, 81		0-5		I.E. Degree
506	Railroad	Pa.		11, 13, 31, 36, 42, 43	5.7- 7.2	0-2	24-30	I.E. or I.M. Pref.
507	Railroad	Pa.		31-38, 51-53	7.2- 9.6	2-5	24-35	I.E. or I.M. Pref.
511	Pharmaceutical	Mich.		General		0-5		I.E. Degree
513	Pulp & Paper	N.C.		11,12,18,19,21,24,32,35,36,43,52		2-5		MTM Exp.
514	Air Force	Ohio	25%	12, 17, 18	8.8-10.0	4½-		B.S.I.E. or M.S.I.E.
515	Air Force	Ohio	25%	40	8.8-10.0	4½-		B.S.I.E. or M.S.I.E.
516	Air Force	Ohio	25%	32, 37	8.8-10.0	4½-		B.S.I.E. or M.S.I.E.
517	Air Force	Ohio	25%	10, 13, 16	8.8-10.0	4½-		B.S.I.E. or M.S.I.E.
518	Air Force	Ohio	25%	Broad I.E.	8.8-10.0	4½-		B.S.I.E. or M.S.I.E.
519	Automotive Parts	Mich.		10	6.0- 9.0	3-5		College Degree
520	Automotive Parts	Mich.		30	6.0- 9.0	3-5		College Degree
522	Ind. Fastenings	Ill.		11, 14, 15, 19, 36, 38, 43, 45, 71	6.0- 7.8	1-3	-35	
523	Utilities	D.C.		10, 13, 17, 37, 50	5.7-	0-	25-	I.E. Degree
524	Utilities	D.C.		10, 13, 17, 37	6.0- 7.0	2-3	28-	I.E. Degree
526	Paper Prod.	Pa.		31, 35, 50-55	7.5-10.0	3-5	25-40	Adv. Degree
527	Consulting	Ind., Ill., Minn.	X	15, 22, 31, 41, 53, 91	9.0-12.0	10-	35-50	I.E. Degree Pref.
528	Farm Cooperative	N.Y.	X	Broad	8.0- 9.0	5-7		I.E. Deg. Plus B.A. Train.
530	Paper Prod.	Mo.	X	15, 21, 36, 38, 42, 53, 54, 70	6.0-10.0	2-5	24-35	I.E. Degree
531	Consulting	Ohio	X	40, 50, 70, 80, 90	Open	5-15	25-40	B.S. Degree
532	Metal Fasteners	Pa.		11, 15, 19, 26	7.9- 9.0	5-10	28-40	
533	Chemical-Plastics	N.J.		31, 35	Open	4-	35-50	Prod./Inv. Control Exp.
534	Glass	N.Y.	½	11, 42, 43, 44, 45, 46, 47	7.0-	5-	30-40	I.E. or M.E. Degree
537	Printing-Litho.	Wis.		10, 20, 30, 70	8.0-	3-10		
538	Papermaking	Pa.		50, 51, 52, 53, 55	9.0-11.0	3-5	25-35	
539	U. S. Army	Ill.	X	37	10.1-11.0	4-		B.S. Degree
541	Communications Mfg.	N.Y.		81	7.0- 9.0	3-	30-40	
542	Electronics	N.Y.		19, 42, 43	5.2- 8.5	0-3		B.S.—I.E., I.M., or M.E.
543	Air Force (Maint.)	Pa.		11, 13, 18, 44, 53, 91	7.5	4-	25-40	I.E. Degree
544	Consulting	Ill.		50-54	7.5-11.0	0-5	21-35	Adv. Degree Pref.
545	Consulting	Pa.	X	Broad	8.0-12.0	5-	28-45	
546	Consulting	Ill.	½	Broad	8.0-12.0	5-	28-40	
547	Home Appliances	Ohio		11, 13, 16, 21, 36	7.2- 9.6	4-6	25-35	I.E. Degree—Mtm. Exp.
552	Smelt. & Titanium	Canada			7.0- 8.5	5-10		
553	Sugar Refining	Mass., Md., La.		11, 36, 38, 43	6.2-	0-5		I.E. Degree
554	Auto. Elect. Electro-Mechanical Equipment	Midwest		10, 32, 42	15.0-20.0		38-46	E.E., M.E., or I.E. Degree
555	Office Machy.	Mich.		11, 30-37	9.6-	3-	30-40	Exp. in System Analysis
556	Office Machy.	Mich.		30	9.6-	3-5		Exp. in Quality Control
557	Corrugated Boxes	Tex.		10, 21-23, 26, 42, 60	6.0-	2-3	23-34	I.E. Degree
558	Food Processing	Minn.		36, 38		2-		I.E. or I.M. Degree
559	Machine Tool Mfg.	Wis.		Project Engineer	Open	0-3	Open	B.S.M.E. or I.E. Equiv.
560	Machine Tool Mfg.	Wis.		Tool Designer	Open	3-5	Open	Degree not Necessary
561	Navy	S.C.		11, 15, 17, 18, 52, 71, 90	7.5- 8.2	2½-		Degree
562	Education	Ariz.		50-52, 54	Open	Open	Open	M.S.
563	Needles	Mo.		92	9.0-10.0	8-10	30-	College Graduate
564	Education	N.D.		30, 40, 50	7.0-	8-	40-50	M.S./Ph.D. or P.E.
565	Structural Clay Prod.	Tex.	X	11, 35-37, 41-43, 49, 53, 71, 92	9.0-11.0	8-12	30-42	B.S.I.E.
566	Education	Mo.		10, 30, 40, 50	Open			
567	Lumbering Mfg.-Cut Parts	La.		10, 30, 32, 33, 40, 48, 94	4.5- 6.5		25-40	
568	Motor Freight	Minn.		43, 81	8.0-12.0	5-10	30-40	Degree in I.E. Pref.
569	Transportation *(See Below)			10, 30, 42, 43, 47	8.4- 9.6	7-	30-	I.E. Degree
570	Transportation *(See Below)			10, 30, 42, 43, 47	7.0- 8.4	4-	20-	I.E. Degree
571	Transportation *(See Below)			10, 30, 42, 43, 47	6.0-	None	20-	I.E. Degree
572	Mgmt. Consultant	U.S.A. & Europe	X	10, 11, 13-18, 21, 22, 91 or 92	Open	5-	30-40	MTM Experience
573	Consulting	Ohio	Ltd.	10, 20, 30, 40, 50	Open	3-	25-	P.E. or E.I.T.
574	Aircraft Parts—(Mach.)	N.J.		10, 11, 13-16, 18, 36, 91	9.0-12.0	8-12	32-45	Engineering Degree
575	Specialty Papers	Mass.		11, 21, 36, 38, 41, 43, 67, 92	7.0-10.0	6-8	30-40	I.E. Deg.—Paper Ind. Exp.
576	Hospital (Teaching)	Calif.		12, 18	7.2- 7.8			
577	Meat Packing	Minn.		10, 11, 13, 22, 38	5.0-	0-2	-30	I.E., M.E., or B.S. Degree
578	Education	Ohio		50-54			Open	M.S./Ph.D.—M.E., I.E., or Applied Math.
579	Pharmaceutical	Ill.		36		3-5		I.E. Degree or Equiv.
580	Solid Propellants	Tex.		11, 12, 19, 32, 34, 41-43, 53	7.0-10.3	2-4	25-35	B.S. in I.E. or M.E. Pref.
581	Paper	Ga.		11, 13, 21, 42 (91 or 92 Exp.)	12.0-15.0	3-	35-48	M.S.I.E. Pref., B.S.I.E. Accep.
582	Paper	Ga.		43	7.5- 8.5		30-40	B.S. in I.E. or I.M.
583	Plastic Molding	Mass.		11, 13-16, 18, 22, 42	7.2-	3-		I.E. Degree
584	Chemical	Pa., W.Va.		11, 18, 38, 52	7.0-	3-	25-	B.S. Degree
585	Garment Mfg.	N.J.		10	5.2- 5.7	0-2		I.E. Degree
586	Glass Containers	Ind.		10, 11, 13, 14, 16, 21, 31, 36	6.3- 7.2	2-5	22-32	
587	Naval Avionics	Ind.		11, 30, 40, 70	6.2- 7.5	2-4		I.E. Degree
588	Printing	Ohio		10, 20, 30, 40, 42, 43	6.6- 7.5	2-7	-30	I.E. or M.E. Degree
589	Semiconductors	Ariz.		11, 12, 15, 18, 19, 26, 36	6.0-10.0	2-5	25-35	B.S. Pref.
590	Semiconductors	Ariz.		42, 43	6.0-10.0	2-5	25-35	B.S. Pref.
591	Semiconductors	Ariz.		66	6.0-10.0	2-5	25-35	B.S. Pref.
592	Paper Converting	Ohio		10-19, 36, 38, 40-49, 53	6.3- 9.0	Open	Open	I.E. or M.E. Degree
593	Metal Working	Mich.		10, 11, 13, 20, 39, 42	10.0-	10-		Engineering Degree
594	Chemical Mfg.	Tex.		11, 30, 32, 34, 43	7.0- 9.5	2-6	27-40	B.S.I.E.
595	Plastics	Ill.		11, 42-46	7.2- 8.4	5-		B.S.M.E. or B.S.I.E.

* The above 3 P⁄ have openings in New York City, Detroit, Mich., Syracuse, N. Y., Indianapolis, Ind., and Cleveland, Ohio

Key to Job Classifications

No.	Job Classification
10	Motion and Time Study
11	Methods Improvement
12	Suggestion Systems
13	Work Measurement and Perf. Stds.
14	Stop Watch Time Study
15	Std. Time Data Dev. & Applic.
16	Predeter. Elemental Time Stds.
18	Work Sampling
19	Estimating and Costing
20	Wage Payment
21	Incentive Plans
22	For Production Workers
23	For Non-Prod. Workers
24	For Supervisory Personnel
26	Job Evaluation
28	Wage Administration
30	Production Engineering
31	Production Control
32	Process Planning and Routing
33	Scheduling and Loading
34	Flow Process Charting
35	Inventory Control
36	Cost Anal. & Reduction
37	Statistical Quality Control
38	Budgetary Control, Standard Costs
39	Tool and Gage Design and Control
40	Plant Engineering
41	Plant Location & Expansion
42	Plant Layout
43	Material Handling
44	Machinery & Equipment
45	Specif., Select. & Eval.
46	Replacement
47	Automation
48	Plant Maintenance
49	Cap. Budget. Facil. Plan
50	Operations Research
51	System & Simulation with "Models"
52	Mathematical Analysis
53	Engr. Economy Studies
54	Auto. Data Proc. with Computers
55	Market Research & Forecasting
60	Industrial Relations
61	Personnel Administration
62	Personnel Testing
63	Personnel Training
64	Industrial Psychology
65	Labor Relations
66	Safety Engineering
67	Suggestion Systems
70	Systems and Procedures
71	Admin. & Operating Procedures
72	Organization Charts and Manuals
73	Records Admin. & Form Control
80	Product Design
81	Packaging
90	Management and Supervision
91	Industrial Engineering Supr.
92	Chief I. E. or Equiv.
93	Plant Engineer
94	Production Supervisor
95	Plant Mgr., Fact. Mgr., Works Mgr.
96	General Manager

AIIE Membership Roster*

November 1, 1959

Aaron, Harold, 4430 Parkside Drive, Baltimore 6, Maryland *42A-2*
Abatemarco, Michael R., 1838 Eighty-fourth Street, Brooklyn, New York *5A-2*
Abbe, Walter, III, Route #7, Twin Oaks Drive, Winston-Salem, North Carolina *21A-2*
Abbott, Benjamin E., Jr., 1153 North Webster Drive, Pensacola, Florida *33A-1*
Abbott, Harrison T., OMETP Rock Island Arsenal, Rock Island, Illinois *46M-4*
Abbruzzese, Antonio, 17 Old Niskayuna Road, Loudonville, New York *0A-1*
Abdi, William, Quebec Arms Apartment 101, 8222 Fourteenth Avenue, Hyattsville, Maryland *14A-2*
Abdullah, Ibeahim, 599 West End Avenue, New York 24, New York *5A-2*
Abel, Carl H., 3525 South Sandusky, Tulsa 5, Oklahoma *15A-1*
Abel, Robert W., 2125 Claussen Street, Davenport, Iowa *46A-2*
Abel, Roy, Jr., 2519 West Macon Street, Decatur, Illinois *80M-4*
Abelman, Alan N., 3 Forest Road, Green Acres, Valley Stream, New York *5A-2*
Abendschein, Irving D., 7820 Comolette Street, Downey, California *23M-4*
Aberg, Robert L., 5908 Lenox Road, Bethesda Chevy Chase 14, Maryland *14A-2*
Abernathy, John W., Box 871, Tulsa, Oklahoma *15M-3*
Abrahamson, Warren D., 224 Fairmont Street, Vallejo, California *12M-4*
Abramowitz, Stanley, 15 Featherbed Lane, New York 52, New York *5A-2*
Abrams, Abraham Harold, 1705 Caton Avenue, Brooklyn 26, New York *5M-4*
Abrams, Sam H., 331 South Jackson Street, P.O. Box 137, Brookhaven, Mississippi *0A-1*
Achin, Gerard R., 85 Arnold Road, North Attleboro, Massachusetts *30A-2*
Acker, David B., 6594 Avenida De-La Manana, La Jolla, California *29M-3*
Acker, David B., 9838 Ahmann Avenue, Whittier, California *23M-4*
Acker, Gale L., 3698 Higland Road, Lafayette, California *12A-2*
Ackerman, Milton, 1 Center Drive, Syosset, Long Island, New York *86A-2*
Ackerson, Colin, 8015-39 N.E., Seattle 15, Washington *20A-2*
Acree, Marberry B., 457 Terra Lane, Amherst, Ohio *7A-4*
Adamo, Edmund B., Fairview Avenue, P.O. Box 168, Milford, New Jersey *77M-4*
Adams, Adam J., Inland Steel Company, 3210 Watling Street, East Chicago, Indiana *53M-3*
Adams, Bluford L., 2391 Webb Avenue, Bronx, New York *5A-4*
Adams, Foster E., 1211 Fourteenth Street, Bettendorf, Iowa *46M-4*
Adams, Harry Emerson, 4467 Mount Everst Boulevard, San Diego 17, California *29M-3*
Adams, Horace Milton, P.O. Box 452, Mayodan, North Carolina *21M-4*
Adams, Hugh S., Eastman Kodak, Industrial Engineering Division, Kodak Park B-56, Rochester 4, New York *44M-4*
Adams, James E., International Nickel Company Incorporated, Guyan River Road, Huntington 17, West Virginia *58A-2*
Adams, James W., 227 Twenty-fifth Street, Santa Monica, California *23A-1*
Adams, Jerry D., P.O. Box 241, Helotes, Texas *39A-2*
Adams, Jim D., 1238 Derby Drive, Richardson, Texas *10A-1*
Adams, Robert Bruce, 194 (Rear) Lincoln Street, Hingham, Massachusetts *30A-2*
Adams, R. Clark, R.F.D. #1, Buford, Georgia *6A-2*
Adams, Robert M., University of Houston, College of Engineering, Houston 4, Texas *22M-4*
Adams, Robert S., 210 Janice Drive, Athens, Georgia *0A-1*
Adams, Thomas F., 9560 Northlawn, Detroit 4, Michigan *47A-2*
Adams, Thomas O., 220 Taft Street, Gary, Indiana *53M-3*
Adams, William G., 1429 Linville Street, Kingsport, Tennessee *17A-1*
Adamson, David A., 44 Lakecrest Avenue, Rochester 12, New York *44A-2*
Addley, Joseph G., Continental Can Company, 745 York Street, London, Ontario, Canada *87A-1*
Addoms, Jeremy, c/o Ross Tabor, Booz, Allen & Hamilton International, Limited, 1625 Eye Street, N.W., Washington 6, District of Columbia *31M-4*
Adelaar, Robert A., 4901 Trent Drive, San Jose 24, California *37A-1*
Adey, Earl W., Marion Power Shovel Company, Marion, Ohio *0A-1*
Adkins, Edsel C., 2155 Hemlock, Imperial Beach, California *29A-1*
Adler, Alfred, 12 Everly Street, Madison Township, Old Bridge, New Jersey *61A-2*
Adler, George J., 3825 East 123 Street, Cleveland 5, Ohio *7A-2*
Agnone, Daniel C., Box 68, New Bedford, Pennsylvania *24A-1*
Agrippino, Placido, 600 East Jeefferson Avenue, Pomona, California *23A-1*
Aguzin, August J., 10655 Gerald Drive, Baton Rcuge, Louisiana *41M-3*
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Ahlquist, Philip W., 1734 West Fourteenth Street, Erie, Pennsylvania *51A-2*
Aho, Esther M., 204 Buchanan Avenue, Cocoa Beach, Florida *0A-1*
Aiken, Ben D., 4115 Park Avenue, Miami 33, Florida *40A-1*
Aikman, Loy M., Herscher, Illinois *0A-1*
Ainslie, Donald F., 42 Mitre Place, Toronto 15, Ontario, Canada *87A-1*
Aitchison, William H., 8 Rowse Crescent, Toronto 15, Canada *87AF-3*
Akers, Rogers M., 19541 Puente Street, Covina, California *78M-4*
Akins, Paul S., Park Avenue, Statesboro, Georgia *0A-1*
Akridge, Melvin E., American Sugar Refining Company, 7417 North Peters Street, Arabi, Louisiana *74A-2*
Alberga, Glenn H., 16818 Holbrook, Shaker Heights 20, Ohio *7M-4*
Albergine, Geno P., 165 Garden Parkway, Henrietta, New York *44A-2*
Albert, George A., 3350 Daleford Road, Shaker Heights 20, Ohio *7A-2*
Albert, George L., 18465 Center Street, Castro Valley, California *12A-4*
Albert, Harry S., Headquarters Air Material Command, Box #1454, Wright-Patterson Air Force Base, Ohio *2A-2*
Albert, Raymond J., 142 Elm Drive, Rochester 9, New York *44A-2*
Albert, Richard, 1505 Edgewood Avenue, Trenton 8, New Jersey *31A-4*
Alberts, Walter M., 101 Lloyd Avenue, Apartment #10, Pitts-

* The remainder of the roster will be published in the March-April issue. If errors in spelling of names and addresses are found, notify Headquarters in Columbus, Ohio, in order that records may be corrected.

burgh 18, Pennsylvania *3M-3*

Alberts, Warren E., United Air Lines, 5959 Cicero Avenue, Chicago 38, Illinois *25M-4*

Albertson, James J., 7423 Dunstan Street, Springfield, Virginia *14A-2*

Albertson, Philip E., c/o Charles Machine Works, Perry, Oklahoma *0A-1*

Alberty, Bryce E, 2325 Titus Avenue, Rochester 22, New York *44M-4*

Albrecht, Robert F., 3108 Thirty-fifth Street, Rock Island, Illinois *46A-2*

Albright, C. Barton, Albright & Hight, Industrial Mechanical Engineers, 550 West Indian School Road, Phoenix, Arizona *70M-4*

Albright, Richard M., 1007 Broad Avenue, N.W., Canton 8, Ohio *19A-1*

Albritton, Bobby G., United States Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio *2A-4*

Alderson, Ronald H., William Neilson, Limited, 277 Gladstone Avenue, Toronto, Ontario, Canada *87A-1*

Aldridge, Donald Eugene, 2109 State Street, Alton, Illinois *16AF-4*

Aldridge, Edgar D., 853 Watson Avenue, Winston-Salem, North Carolina *21M-4*

Alenik, Leon, 1216 Windmill Court, Arlington, Texas *10A-1*

Alexander, Harry B., 1425 Twentieth Street, N.W., Canton 9, Ohio *19A-3*

Alexander, Jack K., 400 South Street, Reading, Massachusetts *62A-2*

Alexander, Michael, 1 Faulkner Drive, Westfield, New Jersey *61M-4*

Alexander, Richard L., 7083 Olive Street, Highland, California *78A-2*

Alexander, Walter J. D., 228 West Eighth Avenue, Huntington 1, West Virginia *58M-4*

Alexander, Walter M., Fiber Glass Division, Pittsburgh Plate Glass Company, Shelby, North Carolina *0M-3*

Alkofer, Lawrence H., 125 East 112 Street, Seattle 55, Washington *20A-2*

Allcott, Charles R., Prudential Federal Savings and Loan Association, P.O. Box 540, Salt Lake City 10, Utah *50A-2*

Allderige, John M., Department of Industrial and Engineering Administration, Cornell University, Ithaca, New York *44M-4*

Allegri, Theodore H., 5401 Riverdale Road, Riverdale, Maryland *14M-4*

Allen, Andrew W., Campbell Soup Company, General Office, Camden 1, New Jersey *31A-2*

Allen, C. G., Box 174, 3377th Schron., Amarillo Air Force Base, Texas *59A-1*

Allen, Clarence J., 2505 North Ninetieth Street, Wauwatosa 13, Wisconsin *45A-2*

Allen, Donald B., 402 South East First Avenue, Gainesville, Florida *27A-2*

Allen, Floyd B., 419 Balsam Street, Elmira, New York *48M-3*

Allen, George C., Jr., 206 East Seventeenth Street, Lumberton, North Carolina *0A-1*

Allen, Herbert J., 5920 Southwest Forty-sixth Avenue, Portland 19, Oregon *67A-1*

Allen, H. Robert, St. Regis Paper Company, Cantonment, Florida *33A-1*

Allen, J. Charles, 2998 Gordon Road, S. W., Atlanta 11, Georgia *6A-2*

Allen, Jay E., 445 South 560 East, Orem, Utah *50AF-4*

Allen, Jerry E., Box 32, 2710 Installations Squadron, APO 323, San Francisco, California *0A-1*

Allen, John Charles, United States Army CMLC School, COBC Class 1, Fort McClellan, Alabama *0A-1*

Allen, John H., 8 Lakeview Drive, The Groves, Mount Pleasant, South Carolina *0A-1*

Allen, Richard Arthur, 549 Alicia Way, Los Altos, California *37M-4*

Allen, R. E., 109 Irving Road, Rochester 18, New York *44M-4*

Allen, Roy L., 1113 New Road, Waco, Texas *0M-3*

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Allen, Wyeth, Chairman, Industrial Engineering Department, University of Michigan, Ann Arbor, Michigan *0M-3*

Allingham, David G., Industrial Engineering Office, Cerro de Pasco Corporation, La Oroya, Peru, South America *0AF-3*

Allison, Arthur V., 1645 Rollins Road, Burlingame, California *37M-4*

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Allison, Lester L., Jr., 7408 Charlotte St., Springfield, Virginia *14A-4*

Allman, William E., 1737 Shenandoah Road, Florence, Alabama *0A-3*

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Almaguer, Rudolph, 119 Norman Road, Newark 6, New Jersey *61A-2*

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Alt, Louis M., 2120 Freiburger Lane, Lafayette, Indiana *35M-4*

Altenhaus, J. L., 49 Claremont Drive, Maplewood, New Jersey *61M-4*

Alter, E. DeVon, Burlington, Indiana *35AF-4*

Alter, Robert D., 6736 Paxton, Chicago 49, Illinois *25A-1*

Altevogt, Robert E., 5202 Lillie, Fort Wayne, Indiana *34A-1*

Altman, Fred D., 5555 North California, Chicago 25, Illinois *25A-1*

Altman, James L., 903 South Dakota Avenue, Tampa, Florida *91A-2*

Altpeter, Ted R., Industrial Engineering Supervisor, Canadian Johns Manville Company, Limited, P.O. Box 610, North Bay, Ontario, Canada *87A-1*

Alutin, Richard A., 180 W. Duarte Road, Arcadia, California *23A-1*

Alvarez, Pedro F., Jr., Apartado #1044, Caracas, Venezuela, South America *0A-1*

Alvarez, Raul E., 2713 Clark Avenue, Raleigh, North Carolina *66M-3*

Amerman, Eugene C., Jr., Industrial Engineer, The Colorado Fuel and Iron Corporation, P.O. Box 316, Pueblo, Colorado *32AF-3*

Amery, Fred W., 1621 Lexington, Pueblo, Colorado *32M-3*

Ames, Donald B., Main Street, Lincoln Park, New Jersey *61A-2*

Ames, John F., 116 Market Street, Lewisburg, Pennsylvania *89M-3*

Ames, Millard R., Jr., W. Genesee Turnpike, Camillus, New York *13M-4*

Amick, Arthur H., III, 1014 Baylor Drive, Nottingham Green, Newark, Delaware *100A-3*

Amidon, D. Curtis, 532 East Front Street, Lititz, Pennsylvania *71M-4*

Amirault, Francis R., 31 Georgia Road, South Weymouth 90, Massachusetts *30A-2*

Amos, Robert B., 9501 Southeast Fifteenth, Midwest City, Oklahoma *1A-2*

Amrine, Harold T., Department of Industrial Engineering, Michael Golden Laboratory, Purdue University, Lafayette, Indiana *35M-4*

Amster, Herman B., Federal Telephone and Radio Company, 100 Kingsland Road, Clifton, New Jersey *61M-4*

Amundsen, Ivar, 10052 S.E. Ninety-fifth Place, Renton, Washington *20A-2*

Anania, Vincent J., 35-16 Seventy-sixth Street, Jackson Heights 72, New York *5M-4*

Andersen, Andrew J., 3621 Lyndale Drive, Johnson City, New York *96A-3*

Anderson, A. Ward, 400 North Walnut Street, Mechanicsburg, Pennsylvania *95A-2*

Anderson, Charles C., Cannon Electric Company, 666 East Dyer Road, Santa Ana, California *23A-1*

Anderson, Charles N., 4626 Riverview, Louisville 11, Kentucky *18M-3*

Anderson, Charles W., Jr., 503 North College Avenue, Douglas, Georgia *0A-1*

Anderson, Clifton A., Head, Industrial Engineering Department,

North Carolina State College, Raleigh, North Carolina *66M-3*
Anderson, Colin J., 1264 Kearney Street, Denver 20, Colorado *32A-1*
Anderson, C. Theodore, Western Electric Company, P.O. Box 1400, Peony Park Station, Omaha, Nebraska *90M-4*
Anderson, David W., Box 296 Headquarters OOAMA, Hill Air Force Base, Utah *50A-2*
Anderson, E. G., Jr., Headquarters, United States Army, COMZ, Europe, Engineer Division, APO 58, New York, New York *0A-1*
Anderson, Emil H., 21 Edgewood Drive, Torrineton, Connecticut *75AF-4*
Anderson, George, Union Bag-Camp Paper Corporation, 233 Broadway, New York 7, New York *5A-2*
Anderson, George G., P.O. Box #427, Shirley, Massachusetts *61A-2*
Anderson, J. Donald, 339 High Street, Santa Cruz, California *12M-4*
Anderson, Jack P., 3071 Daytona Avenue, Cincinnati 11, Ohio *8A-4*
Anderson, Jeff Lenvol, 852 Westlink Drive, Wichita 12, Kansas *56M-4*
Anderson, John F., 27635 Lorrai, Warren, Michigan *47M-4*
Anderson, Kenneth W., Ucinite Company, Division United-Carr, 459 Watertown Street, Newtonville 60, Massachusetts *30M-4*
Anderson, Marvin H., c/o International Seal and Lock Company, Hastings, Michigan *47A-2*
Anderson, Marvin L., 2008 South Zenobia, Denver 19, Colorado *32A-1*
Anderson, Matthew G., MR 13, Butler, Pennsylvania *0M-3*
Anderson, Parker S., 81 Glenlawn Avenue, Sea Cliff, New York *86M-4*
Anderson, Philip D., 699 Boulevard Road, Keokuk, Iowa *0A-1*
Anderson, Ralph N., 508 Hastings Street, Redlands, California *78M-4*
Anderson, Raymond L., Box 337, McCormick, South Carolina *0M-3*
Anderson, Robert Carl, 6035 Birch Street, Omaha 4, Nebraska *90M-4*
Anderson, Robert M., Jr., 305 Clifton, Houston 11, Texas *22A-1*
Anderson, Robert S., P.O. Box 146, Pahala, Hawaii *0A-1*
Anderson, S. C., Jr., 374 East Paces Ferry Road, Apartment 217, Atlanta 5, Georgia *6A-2*
Andes, Norman Robert, Atlantic Refining Company, 260 South Broad Street, Philadelphia, Pennsylvania *31M-4*
Andreiko, Albert, 9351 Loyola Boulevard, Los Angeles 45, California *23M-4*
Andres, Cletus N., 28 Elvira Drive, Belleville, Illinois *16A-4*
Andres, W. A., P.O. Box 834, Albany, Texas *0A-1*
Andrew, Arthur A., Staff Industrial Engineer, 1408 Breezeridge Drive, Des Peres 22, Missouri *0M-3*
Andrews, David R., 400 Dellwood Road, Rochester 16, New York *44M-4*
Andrews, Donald K., Jr., 2420 Northwest Fifty-fourth Street, Oklahoma City 12, Oklahoma *57M-4*
Andrews, George H., 705 Dahlia Street, N.W., Washington 12, District of Columbia *14M-4*
Andrews, Gerald W., Route #2,, Box 366D, Martinsville, Virginia *21A-2*
Andrews, James R., 1017-C Shadyside Lane, Dallas 23, Texas *10A-3*
Andrews, Joe B., 3910 Seventh Avenue, Rock Island, Illinois *46A-2*
Andrews, Robert B., School of Business Adminstration, University of California, Los Angeles 24, California *23A-1*
Andrews, William F., 7 Crocker Avenue, Johnson City, New York *96A-1*
Andrews, W. T., 12020 South Patton Drive, Downey, California *23M-4*
Andricos, Peter G., 908 North Lilac Lane, Midwest City, Oklahoma *57A-4*
Andrunas, Anthony V., P.O. Box 2052, San Diego 12, California *29AF-3*
Andrysick, Edward F., Corning Glass, Fall Brook Plant, Tioga Street, Corning, New York *48A-1*
Angert, James A., 20 Greening Count 10, Rochester 10, New York *44A-4*
Angevine, James L., 55 H Street, Encinitas, California *29M-3*
Anhalt, Jerome, 35 Sandalwood Avenue, Valley Stream, New York *5M-4*
Anibal, Arthur W., Eastman Kodak Company, Kodak Park, 1669 Lake Avenue, Rochester 15, New York *44AF-4*
Annin, William P., Jackes Evans Manufacturing Company, 4427 Geraldine, St. Louis 15, Missouri *16A-2*
Anthony, John C., Jr., 509 Scott Drive, Marietta, Georgia *6A-2*
Anthony, Mark J., 1851 Wesleyan Road, Dayton 6, Ohio *2A-4*
Anthony, Roderick A., 320 Cody, Houston 22, Texas *22AF-3*
Anton, George L., 1506 Louise Avenue, Arcadia, California *23A-1*
Antonietta, George J., 41 Kinry Road, Poughkeepsie, New York *76A-2*
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Apple, James M., 801 Moulton Avenue, North Muskegon, Michigan *47M-4*
Applegate, George H., Jr., Strong Road, Southampton, Massachusetts *94M-4*
Appleton, W. O., 9152 Calle Vejar, Cucamonga, California *78A-2*
Apte, G. V., G. E.'s Office, TISCO, Jamshedpur-4, India *4A-8*
Aragon, Louis E., 1132 Florida, S.E., Albuquerque, New Mexico *59A-1*
Arboe, Ralph W., American Air Filter, Moline, Illinois *46M-4*
Arbogast, Donald P., The Cincinnati Shaper Company, Box 111, Cincinnati 11, Ohio *8A-2*
Arbuckle, Edward C., 1105 Cedar, Richland, Washington *20A-2*
Arden, J. W., 204 Park View Drive, Brevard, North Carolina *83A-2*
Ardis, Louis H., 6617 Saxet Street, Houston 24, Texas *22A-1*
Arenburg, Donald H., P.O. Box 82, Lone Star, Texas *60M-4*
Arendes, Harold W., 9928 Norbridge Lane, St. Louis 37, Missouri *16M-4*
Arentson, Robert W., Hammermill Paper Company, East Lake Road, Erie, Pennsylvania *51M-4*
Arguello, Edward J., 401 West Madison Avenue, Apartment 13, Dumont, New Jersey *61A-2*
Argust, Frank F., 238 Dittmer, Pueblo, Colorado *32M-3*
Armanino, Frederick D., 1720 Quesada Avenue, San Francisco 24, California *12A-2*
Armfield, Robert M., 901 Charles Drive, Guilford College Branch, Greensboro, North Carolina *21A-2*
Armour, Gordon C., 913 Granville Avenue, Apartment 1, Los Angeles 49, California *23A-1*
Armstrong, Oran R., 813 Kenwick Drive, Winston-Salem, North Carolina *21A-2*
Armstrong, Robert J., 124 Downing Road, Dewitt 14, New York *13M-4*
Armstrong, W. H., West Virginia University, College of Engineering, Morgantown, West Virginia *0A-1*
Armstrong, William M., 10326-61 South, Seattle, Washington *20A-2*
Arndt, Herbert L., Department 731, International Business Machines Corporation, Neighborhood Road, Kingston, New York *76A-2*
Arney, Dean S., 2318 Bellevue Avenue, Bettendorf, Iowa *46A-2*
Arnhold, Walter F., Chief Industrial Engineer, Kollmorgen Optical Company, 347 King, Northampton, Massachusetts *94M-4*
Arnold, Allen, 1124 Glenville Drive, Los Angels 35, California *23A-1*
Arnold, Edward B., 28 Villa Street, Waltham, Massachusetts *30AF-4*
Arnold, Harold T., 95 Twiss Road, North Chemlsford, Massachusetts *62M-4*
Arnold, Robert L., Jr., 60 Sutton Place South, Apartment 8-M-North, New York 22, New York *5A-4*
Arnold, Robert P., 4955 Rittenhouse Drive, Dayton 24, Ohio *2A-2*
Arnold, Thomas I., Jr., Sanders Associates, Incorporated, 95 Canal Street, Nashua, New Hampshire *62M-4*
Arnold, Wallace D., 3957 East Boulevard, Los Angeles 66, California *23A-1*
Arnsman, John H., Owens-Illinois, Gas City, Indiana *34M-3*

Aronson, Arthur E., 2818 North Schoenbeck Road, Arlington Heights, Illinois *25M-4*
Aronson, Sheldon, 857 Palisade Avenue, Yonkers, New York *5A-2*
Arose, Sam, 309 Knollwood Drive, Charleston 2, West Virginia *58A-2*
Arquette, Donald W., 2709 June, N.E., Albuquerque, New Mexico *59A-1*
Arrington, Harry L., 2992 Glenrock Drive, Macon, Georgia *55A-1*
Arva, Robert H., 1633 Apricot, Harrisburg, Pennsylvania *95A-2*
Arvin, Edwin H., Jr., 3223 Ellwood Avenue, Richmond 21, Virginia *0A-1*
Arwood, John R., 1078 East Twenty-fifth Street, Paterson, New Jersey *5A-2*
Arzbaecher, Richard J., Ford Motor Company, Box 591, Georgetown Road, Canton 1, Ohio *19M-3*
Asalone, Anthony J., 27 Tyndall Road, Franklin Park, New Jersey *5A-2*
Asche, Charles H., 5670 Southwest Fourth Street, Miami, Florida *40A-3*
Aschmann, Charles G., Jr., Code 309 Norfolk Naval Shipyard, Portsmouth, Virginia *99M-4*
Ascough, Howard M., Jr., Atlantic Refining Company, 260 South Broad Street, Philadelphia 1, Pennsylvania *31M-4*
Ashby, Charles A., 29 Edgewood Road, Chatham, New Jersey *61A-2*
Ashcroft, Herbert, Bausch and Lomb Optical, 635 St. Paul Street, Rochester 2, New York *44M-4*
Asher, Billy B., Sandia Corporation, Division 4111, Sandia Base, Albuquerque, New Mexico *59A-1*
Ashford, Kerwin N., 14 Edgemont Drive, Little Rock, Arkansas *84A-1*
Ashton, Ralph J., 306 Ross, Middletown, Ohio *8A-2*
Ashway, Barry D., 1599 Clover Lane, York, Pennsylvania *72A-2*
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Askew, Leon C., 358 Holderness Street, Atlanta, Georgia *6A-2*
Askew, Robert L., 215 Walnut Street, Berryville, Virginia *0A-1*
Askin, Kurt, 4323 Roosevelt Way, Seattle 5, Washington *20A-2*
Astolfi, Arch T., 163 Summer Street, Danvers, Massachusetts *30M-4*
Aton, Francis L., American Air Filter Company, 215 Central Avenue, Louisville 8, Kentucky *18A-1*
Atwood, David E., Route #1, Cleburne, Texas *0A-1*
Aubry, Richard W., 804 Sixteenth Avenue, Moline, Illinois *46M-4*
Auburn, Travers, Republic Aviation Corporation, Farmingdale, Long Island, New York *86M-4*
Auer, Ralph L., 167 Finger Avenue, Redwood City, California *37A-1*
Auerbach, Shelley, 2157 Holland Avenue, New York 62, New York *5A-2*
Augunas, Julius E., Revere Drive, East Foxboro, Massachusetts *30A-2*
August, Richard S., 931 Willivee Drive, Decatur, Georgia *6A-2*
Augustin, Kenneth A., 7736 Grand, Kansas City, Missouri *92A-2*
Aukerman, Robert W., 2220 West Viewmont Way, Seattle 99, Washington *20M-4*
Ausness, Arthur R., 2717 Angus Street, Los Angeles 39, California *23M-4*
Austin, Edward B., 702 South Fairplay, Seneca, South Carolina *0A-1*
Austin, James T., 349 Elmdale Ave., Akron 20, Ohio *52A-2*
Austin, Ralph O., 3921 Oxbow Drive, Nashville 7, Tennessee *73A-1*
Austin, Robert O., Industrial Engineer, Myerson Tooth Corporation, 90 Hamilton Street, Cambridge 39, Massachusetts *30M-4*
Austin, Sam M., 2805 Northwest Sixty-sixth Street, Oklahoma City 16, Oklahoma *57A-2*
Avant, John P., 508 West Main Street, Wetunpica, Alabama *0A-1*
Avery, Neil, Jr., P.O. Box 483, Orange Park, Florida *27A-4*
Avitabile, Albert J., Industrial Engineer, Airequipt Manufacturing Company, Incorporated, 20 Jones Street, New Rochelle, New York *5A-2*
Awad, George J., 115 Morningside Drive, Chattanooga 4, Tennessee *54A-2*
Awbrey, Richard E., 11740 Woodbine Street, Los Angeles 66, California *23A-1*
Ayala, Julius J., 1623 Skyline Drive, Pittsburgh 27, Pennsylvania *3A-1*
Aydtell, Charles L., 281 Washington Street, Marblehead, Massachusetts *30A-2*
Ayers, Emory D., Union Carbide Chemicals Company, P.O. Box 8361, South Charleston 3, West Virginia *58A-2*
Ayers, Herbert G., 1420 Hillcrest Drive, Laguna Beach, California *23M-4*
Aymes, Doniel G., R.D. #2, Gale Drive, Blue Ridge Park, Harrisburg, Pennsylvania *71A-4*
Ayres, William B., Jr., 6404 Chevy Chase, Dallas, Texas *10A-1*
Axeman, Peter H., 47 Cliffside Drive, Williamsport, Pennsylvania *89A-2*
Axenfeld, Stanley E., 7642 Brentwood Road, Philadelphia 31, Pennsylvania *31A-2*

Babb, Ramon L., 714 Green Street, Warner Robins, Georgia *55A-3*
Babillus, John, 1381 Elmhurst Drive, N.E., Cedar Rapids, Iowa *0M-3*
Babyar, Mimer, 1112 Woodland Drive, Manchester, Tennessee *64M-3*
Bachlotte, Maurice R., E. I. duPont de Nemours Company, Old Hickory, Tennessee *73M-3*
Bachman, John L., 105 Wyndover, Rochester 16, New York *44A-2*
Bachtel, Homer E., 200 West North Street, Syracuse, Indiana *34A-1*
Backe, Carl C., 8431 Twenty-second, S.W., Seattle 6, Washington *20A-2*
Backes, Robert F., 1462 Golding Drive, Reynoldsburg, Ohio *1A-2*
Bacon, Garland Ray, 376 Wrexham Avenue, Columbus 23, Ohio *1A-2*
Baczek, Tadeusz A., 4040 Saint James Place, San Diego 3, California *29A-1*
Badash, Sanford, 308 Seventeenth Street, Columbus, Indiana *65A-2*
Bade, Robert E., 491 Ohio Street, Akron, Ohio *7A-2*
Badger, Frank K., 912 Oxford Lane, Wilmette, Illinois *25A-3*
Badger, James B., 6310 Mercado Drive, Jacksonville 10, Florida *27A-2*
Baecker, Harold P., 607 Parkland Circle, S.E., Albuquerque, New Mexico *59M-3*
Bael, Martin B., Recordak Corporation, 770 Broadway, New York 3, New York *5M-4*
Baer, Ralph S., 2705 Ross Road, Chevy Chase, Maryland *14M-4*
Baerenwald, Oscar J., The Gillette Company, Gillette Park, Boston 6, Massachusetts *38M-4*
Bagby, Malcolm A., 1054 Eva Avenue, Fayetteville, Arkansas *15A-1*
Bagdonas, Alphonse J., Supervisor, Methods and Time Standards Department, Continental Aviation and Engineering Corporation, 1330 Laskey Road, Toledo 12, Ohio *36M-4*
Baggott, William K., R.R. 2, Box 272, McLean, Virginia *14A-2*
Baggs, Ora E., P.O. Box 6446, Capitol Station, Phoenix, Arizona *70A-2*
Baier, Frederick L., 1807 East Third Street, Williamsport, Pennsylvania *89A-2*
Bailey, Donald C., 4328 Warren Road, Birmingham 9, Alabama *9A-2*
Bailey, Donald W., Sandyville, West Virginia *58A-2*
Bailey, Eugene H., 22094 Sandy Lane, Cleveland 26, Ohio *7A-2*
Bailey, Gerald B., Wood, Gordon and Company, 15 Wellington Street, W., Toronto 1, Ontario, Canada *87M-3*
Bailey, James R., 106 Dexter Road, Woodbrook, Wilmington 3, Delaware *100M-3*
Bailey, Preston S., Jr., Monroeville, Alabama *0A-1*
Bair, Robert D., 350 Crescent Drive, Hilliards, Ohio *1A-2*
Bair, William W., 1206 Mulberry Street, Montourville, Pennsylvania *89A-2*
Baird, Frank L., Schultz Die Casting Company, 1810 Clinton Street, Toledo 7, Ohio *36AF-4*
Baker, Charles H., Jr., 19 Adams Avenue, Endicott, New York *96A-1*
Baker, David F., 244 Canyon Drive, Columbus 14, Ohio *1A-2*

Baker, John E., Birmingham Slag Company, A Division of Vulcan Material Company, P.O. Drawer 155, Birmingham 2, Alabama *9A-2*

Baker, Robert H., Fox Meadow Lane, Wayland, Massachusetts *30M-4*

Baker, Robert M., 195 Gladys Avenue, Newark, Ohio *1M-4*

Baker, Russell E., Oak Park, Lafayette, Georgia *54A-2*

Baker, Winfred Lee, 246 Marchmont Lane, San Antonio 1, Texas *39A-4*

Balcom, William H., R.R. #2, Kokomo, Indiana *35A-2*

Baldree, Jack N., 440 West Ninth Street, Apartment Fourteen, Erie, Pennsylvania *51A-2*

Baldwin, Charles E., Fereral-Mogul-Bower Bearings, Incorporated, National Seal Division, 150 North Fisher Avenue, Van Wert, Ohio *34M-3*

Baldwin, David K., USS Hale (DD642), c/o FPO, New York, New York *30A-2*

Baldwin, Thomas L., 1872 Twenty-first Street, Cuyahoga Falls, Ohio *52M-4*

Baldwin, William L., United States Naval Ammunition Depot, Apartment #11, McAlester, Oklahoma *57A-2*

Balee, Gunther, 16125 Sunny Court, Whittier, California *23M-4*

Balian, John, 24 Newland Road, Arlington, Massachusetts *30A-2*

Balk, Walter L., Administrational Assistant to Works Manager, International Business Machines Corporation, Saugerties Road, Woodstock, New York *76M-4*

Balkcom, Mark C., Montag Brothers, Incorporated, 245 North Highland Avenue, N.E., Atlanta 7, Georgia *6A-2*

Ball, Albert J., 1067 Locust Street, Perrysburg, Ohio *36A-2*

Ball, Charles F., Jr., 10B Armory Square, Springfield 5, Massachusetts *94A-2*

Ball, Fred R., Lake Drive, Chapel Hill Estates, Ironia, New Jersey *61A-4*

Ball, Maxwell S., A. C. Lawrence Leather Company, 10 Sawyer Street, Peabody, Massachusetts *30A-2*

Ball, Rhett, Heritage Furniture, Incorporated, High Point, North Carolina *21M-4*

Ball, Rowland E. 538 Nottingham, San Antonio 9, Texas *39M-4*

Ball, William T., 15901 East 100th Terrace, Lee's Summit, Missouri *92M-4*

Ballance, John J., International Business Machines Corporation, Department 746, Kingston, New York *76A-2*

Ballantine, Allister R., 547 West Forty-ninth Street, Jacksonville 8, Florida *27A-2*

Ballen, Jerome, 242 Lindbergh Street, Massapequa Park, Long Island, New York *86A-2*

Ballentine, William B., 4021 West Eastman Avenue, Denver 19, Colorado *32A-1*

Ballinger, Leon H., 1560 Tampa Drive, Mobile, Alabama *79A-2*

Ballinger, Robert Elmer, 365 Twenty-sixth, N.W., Massillon, Ohio *19M-3*

Ballot, Robert, 8 Tompkins Avenue, Jericho, Long Island, New York *86A-2*

Balmer, Howard L., 409 Lynhurst Avenue, Horseheads, New York *48A-1*

Balocki, James J., 9039 East Shorewood Drive, Mercer Island, Washington *20A-4*

Baloff, Nicholas, 233 Pomona Street, El Cerrito 3, California *12A-2*

Balog, Steven J., R.R. 2, Box 2809, Sacramento, California *43M-4*

Baloun, Robert J., 3515 West Sixty-first Street, Chicago 29, Illinois *25A-1*

Bamborough, James E., Jr., 554 Elmdale Court, Holland, Michigan *0A-1*

Bammerlin, J. E., 23925 East Oakland, Bay Village, Ohio *7A-2*

Banachowski, Chester W., 5202 Fern Drive, Toledo 13, Ohio *36M-4*

Bandusky, John W., 3756 Kimberly Way, Carmichael, California *43M-4*

Baness, Leonard S., 337 Bristol Lane, Arlington Heights, Illinois *25A-3*

Banta, Thomas R., 5300 Driftwood Circle, Dayton 15, Ohio *2M-4*

Banyai, Daniel J., 1555 Northumberland, Rochester, Michigan *47A-4*

Banziger, Robert E., Waterbury Farrel Foundry and Machine Company, 453 Bank, Waterbury 20, Connecticut *97AF-4*

Barancik, Bill, 11663 Gorham Avenue, Los Angeles 49, California *23A-1*

Barany, James W., 316 North Salisbury, West Lafayette, Indiana *35A-2*

Barat, N. K., 42/D, Durgacharan Mitter Street, Calcutta-6, India *4M-S*

Barber, Robert L., P.O. Box 472, Atmore, Alabama *79A-2*

Barbera, Anthony S., 516 Laurel Avenue, Lyndhurst, New Jersey *61A-2*

Barbour, Alvin Keith, 202 Hillcrest Drive, Union, South Carolina *0M-3*

Barcellona, Matthew R., 6534 Aberdeen, Dallas 25, Texas *10A-3*

Barclay, Allen G., 10 Lookout Road, Mountain Lakes, New Jersey *61A-4*

Barden, Bernard J., 4845 Tilden Drive, San Jose 24, California *37A-1*

Barder, James P., 8743 Marquette Avenue, Chicago 17, Illinois *25A-1*

Bardin, Wilbur S., 31 Rahn Court, Walnut Creek, California *12A-2*

Bardo, Bruce B., 2634 Manhattan Avenue, Hermosa Beach, California *23AF-3*

Barfield, Lowell W., 1805 North Main Street, Moultrie, Georgia *0A-1*

Barfield, William N., 2576 Oak Grove Court, Decatur, Georgia *6A-2*

Barish, Norman N., 7 Carthage Road, Scarsdale, New York *5M-4*

Barker, Phillip E., 444 Willowview Drive, Akron 19, Ohio *52A-2*

Barker, Robert W., P.O. Box 155, Battle Creek, Michigan *34M-3*

Barker, William, 28 Maryvale Crescent, Box 187, Richvale, Ontario, Canada *87M-3*

Barnard, Edward K., Assistant Plant Engineer, Youngstown Welding and Engineering Company, P.O. Box B, West Side Station, Youngstown 9, Ohio *24A-1*

Barnard, John C., 336 Richland Avenue, Havertown, Pennsylvania *31A-2*

Barnes, Bennie G., 2637 Southwest Forty-fourth, Oklahoma City 19, Oklahoma *57A-2*

Barnes, Charles R., 616 West LaDeney Drive, Ontario, California *78A-2*

Barnes, John J., 552 Glenwood, Mobile, Alabama *79A-2*

Barnes, Martin H., Jr., American Radiator and Standard Sanitary, 1541 South Seventh Street, Louisville 8, Kentucky *18A-1*

Barnes, Ralph M., 371 BAE Building, University of California, Los Angeles 24, California *23F-0*

Barnes, Wilbur L., 5 Hesketh Court, Menlo Park, California *12M-4*

Barnes, William H., Jr., 1478 Hunter Lane, Clearwater, Florida *91A-2*

Barnett, Billy J., 120 South Sixth Street, Warner Robbins, Georgia *55A-1*

Barnett, Donald A., 2304 Albion, Denver 7, Colorado *32M-3*

Barnett, Donald L., 2461 Chestnut Drive, Westlake, Ohio *7A-2*

Barnett, James W., 1212 Roma Avenue, N.E., Albuquerque, New Mexico *59A-1*

Barnett, William A., 4615 College Oak Drive, Sacramento 21, California *43A-2*

Barney, Walter F., Apartment 1, 3315 Belcrest, S.E., Huntsville, Alabama *69M-4*

Barnhard, Clyde M., 1742 Maywood Road, South Euclid 21, Cleveland 21, Ohio *7AF-4*

Barnhart, Glenn W., 419 Willowwood Drive, Dayton 5, Ohio *2A-2*

Barnhart, Richard A., 235 East James Street, Chula Vista, California *29M-3*

Barnhart, Robert E., 538 Trevor Street, Brownsburg, Indiana *65A-4*

Barnhill, Walter D., 828 Oaklawn Avenue, Winston Salem, North Carolina *21A-2*

Barnhouse, Dallas B., 3817 Kingman Avenue, N.W., Canton, Ohio *19AF-3*

Barolak, John N., Apartment D, 1548 Harcourt Drive, New Orleans 22, Louisiana *74A-2*

Barolak, Joseph R., 67 Haseltine Avenue, Youngstown 6, Ohio *24M-3*
Baron, Walter E., 274 Fourth Avenue, Sharon, Pennsylvania *24M-3*
Barone, Joseph J., 144 West Sixth Street, Dunkirk, New York *0A-1*
Barr, Ben O., 5524 Bancroft Street, St. Louis 9, Missouri *16AF-4*
Barr, H. Stanley, 6806 Navajo Drive, Baltimore 9, Maryland *42M-4*
Barr, M. L., 1310 Bobwhite, Houston 36, Texas *22A-3*
Barranger, Edwin F., Hughes Aircraft Company, Division 08, Building 15, Culver City, California *23A-1*
Barrere, Leon G., 1401 Drumcliffe Road, Winston-Salem, North Carolina *21A-2*
Barrett, Charles J., Jr., 213 Countryside Drive, Irving, Texas *10A-1*
Barrett, Charles R., P.O. Box 138, Meadow, Texas *0A-1*
Barrett, C. Keith, Upper Black Eddy, Pennsylvania *77A-2*
Barrett, Jack K., Armco Drainage and Metal Products Inc., 2180 Milvia, Berkeley 4, California *12A-2*
Barrow, Curtis M., Dayton Rubber Co., Waynesville, North Carolina *83M-4*
Barry, Charles E., Jr., 2512 Arden Avenue, St. Louis 20, Missouri *16A-2*
Barry, Richard V., Longview Road, North Wilmington, Massachusetts *30A-2*
Barry, Walter D., Jr., 3073 Haverhill Court, Riverside, California *78M-4*
Barsoum, Henry W., c/o Delta Steel Mill S.A.E., Box 144, Cairo (Egypt), United Arabic Republic *0A-1*
Barta, Thomas A., 3903 Jewell Street, San Diego 9, California *29A-1*
Barten, Kenneth S., 820 Leland Avenue, St. Louis 5, Missouri *16A-4*
Barth, Kenneth J., 44 Fairmont Avenue, Stamford, Connecticut *82M-4*
Bartlett, Lawrence B., 560 Glenwood Street, Mobile, Alabama *79A-2*
Bartolacci, A. Ralph, International Business Machines Corporation, North Street, Endicott, New York *96A-1*
Barton, Albert W., United Shoe Machinery Corporation, Research Division, Balch Street, Beverly, Massachusetts *61AF-4*
Barton, Rex L., 4767 One Hundred Nineteenth, S.E., Bellevue, Washington *20A-2*
Barton, Richard S., 928 Southwest Thirty-fourth Street, Oklahoma City 9, Oklahoma *57A-2*
Barton, Robert G., 50 Rolling Ridge Road, Holden, Massachusetts *68M-3*
Bartz-Johannessen, Sigfinn, 783 Coastline Drive, Palo Alto, California *37M-4*
Base, Joseph F., Jr., Kaiser Aluminum and Chemical Corporation, Belpre, Ohio *0M-3*
Basham, John C., Belle Avenue, R.R. #7, Winston-Salem, North Carolina *21A-2*
Bass, H. Harold, Eastman Kodak Company, Industrial Engineering Division, Kodak Park, Building 56, Rochester 4, New York *44M-4*
Bassett, William H., Jr., P.O. Box 2133—Radio Center, Morristown, Tennessee *11A-2*
Bastian, Robert W., 709 Smiley Street, Ellwood City, Pennsylvania *24M-3*
Bastian, William R., Heli-Coil Corporation, Shelter Rock Lane, Danbury, Connecticut *82M-4*
Basu, D. P., 3, St. Mark's Road, Bangalore-1, India *4M-S*
Batchelor, Jack M., 1853 Vesta Way, Sacramento 21, California *43A-2*
Batchelor, Robert C., A. Ramond and Associates, 1615 Tribune Tower, Chicago, Illinois *25M-4*
Batdorf, Richard O., West 3011 Longfellow Avenue, Spokane 14, Washington *0A-1*
Bateholts, Franklin F., 9 Gartner Drive, Ballston Lake, New York *0A-1*
Bateman, Peter B. D., 729 Cloute Street, Fort Atkinson, Wisconsin *45A-2*
Bateman, Richard E., Apartment 14E, Midland Heights, Midland, Pennsylvania *3AF-3*
Bates, James R., Jr., 2129 Dorchester Avenue, Charleston Heights, South Carolina *0A-1*
Bates, John M., Jr., 4101 South Shore, Lake Grove, Oregon *67A-1*
Bath, William C., Box 302, Hendersonville, North Carolina *83M-4*
Batson, William C., 2819 Hermitage Drive, Winston-Salem, North Carolina *21A-4*
Battaglin, Robert M., 12247 Yale, Chicago 28, Illinois *25A-1*
Batterton, Chester V., 4942 Hillard Avenue, LaCanada, California *23A-1*
Battisto, Donald, I.T.E. Circuit Breaker Co., Nineteenth and Hamilton Streets, Philadelphia 30, Pennsylvania *31A-2*
Bauer, David, 901 Madison Street, Apartment 3, Syracuse 10, New York *13M-4*
Bauer, Martin C., Carter Carburetor Corporation, 2840 North Spring, St. Louis 7, Missouri *16M-4*
Baughman, Charles W., Jr., 5719 Marie Tobin, El Paso, Texas *0A-1*
Baughman, Walter F., 300 East Line Street, Minerva, Ohio *19A-1*
Baumann, David, 80-16 Two Hundred Fifty-seventh Street, Floral Park, Long Island, New York *86M-4*
Baumbaugh, Herle R., 1905 Thirty-sixth, N.W., Canton 9, Ohio *19M-3*
Baumer, Edward A., 1109 R. Jefferson Street, Laurel, Mississippi *0AF-3*
Baumgartner, Don A., 333½ Gertrude Street, Elgin, Illinois *25A-1*
Baur, William E., 9 East Dortmouth Circle, Media, Pennsylvania *31M-4*
Bavier, Ralph G., 180 Church Street, Naugatuck, Connecticut *97M-4*
Bawden, Orval C., 666 South 450 East, Orem, Utah *50A-2*
Bayer, William J., 10627 Tesson Ferry Road, St. Louis 23, Missouri *16A-2*
Bayha, Franklin H., 2502 Hazelwood Avenue, Fort Wayne 3, Indiana *34M-3*
Baynard, Lester B., Box 1134, Venice, Florida *91A-2*
Baytosh, Andrew R., Copperweld Steel Company, Mahoning Avenue Extension, Warren, Ohio *24A-1*
Baze, L. Milton, 427 West Pecan, Sherman, Texas *10A-1*
Bazel, Edward J., 1731 Woodward Terrace, Huntington 5, West Virginia *58A-2*
Beach, David H., 7 Plenty Street, Billerica, Massachusetts *62A-2*
Beach, Edmund, 4610 Marble, N.E., Albuquerque, New Mexico *59A-1*
Beacham, Robert C., SKF Industries, Incorporated, Frankford Plant, Tulip and Kennedy Streets, Philadelphia, Pennsylvania *31A-2*
Beakley, George C., 511 East Concorda Drive, Tempe, Arizona *70M-4*
Beal, John D., Jr., 3012 Bayless Drive, Huntsville, Alabama *69M-4*
Beal, Robert S., Service Pipe Line Company, Box 1979, Tulsa, Oklahoma *15A-1*
Beals, Everett S., 74 Villa Drive, Clearfield, Utah *50A-2*
Beals, Paul D., 4719 Vernon, N.W., Canton 9, Ohio *19M-3*
Beals, Robert P., 10114 Talbot, Huntington Woods, Michigan *47M-4*
Beam, John A., Jr., 301 Brannon Drive, Maryville, Tennessee *11A-2*
Beamer, John V., Jr., 840 Elk Spur Street, Elkin, North Carolina *21A-2*
Bean, Albert R., 616 Walnut Lane, Philadelphia, Pennsylvania *31A-2*
Bean, Donald M., R.R. 5, Manchester, Tennessee *64A-1*
Bean, Jack R., 14 Main Road, Maryville, Tennessee *11A-2*
Beaney, Walter V., Jr., 22 West Burns, Shawnee, Oklahoma *57A-2*
Beard, Harold F., Jr., 630 West Fifty-first Place, Hialeah, Florida *40A-1*
Bearse, Joseph V., 15 Beverly Road, Reading, Massachusetts *30M-4*
Beattie, Jacques B., Midwest Manufacturing Corporation, Galesburg, Illinois *80M-4*
Beaty, William Robey, 6111 Washington Avenue, Evansville, Indiana *88M-4*

Beauchamp, James Mercer, Jr., 2101 Allendale Road, Wilmington 3, Delaware *100M-3*
Beauchamp, John S., Potter and Brumfield, Incorporated, 1200 East Broadway, Princeton, Indiana *88A-2*
Beaudine, Frank R., 2928 Lothair Way, Long Beach, Michigan City, Indiana *OM-3*
Beaven, Charles F., R.R. #2, Wadesville, Indiana *88A-2*
Beaver, Robert I., 2014 Newcomer, Richland, Washington *0A-1*
Beavers, Graham L., 3944 Thomas Drive, Oklahoma City 15, Oklahoma *57AF-4*
Bechhold, Robert A., Merck and Company, Incorporated, Rahway, New Jersey *61A-2*
Becht, Lawrence R., 711 First Street, Coronado, California *29M-3*
Beck, Byron E., 618 Williamson, Corpus Christi, Texas *OM-3*
Beck, Clive L., 140 West Sixth North, Pleasant Grove, Utah *50AF-4*
Beck, Harold P., 37-39 Libby Lane, Wantagh, Long Island, New York *5A-2*
Beck, Seymour D., 2118 Wallace Avenue, New York 62, New York *5A-2*
Becker, Arnold E., 6901 Little Schaefer Road, Evansville 12, Indiana *88AF-4*
Becker, Louis A., 425 South Pearl, Denver 9, Colorado *32M-3*
Becker, Nathan, 3513 Sunnywood Drive, Fullerton, California *23A-1*
Becker, Ralph W., 2125 South Monroe, Denver 11, Colorado *32M-3*
Becker, Robert A., 940 Crestview Drive, Pasadena 8, California *23M-4*
Becker, William L., 21825 Grant Avenue, Torrance, California *23A-1*
Beckert, Godfrey M., 1727 Schneider Road, North Canton 20, Ohio *19M-3*
Beckwith, John F., 6350 North West Carson Street, West Linn, Oregon *67A-1*
Beckwith, Peter, 23 Lee Road, Wayland, Massachusetts *30A-2*
Bedale, Fred M., Box 12, Ray, Arizona *70A-2*
Bedics, Michael A., Pawling Rubber Corporation, Pawling, New York *5A-2*
Bedle, Craig D., 42 Sussex Road, Bergenfield, New Jersey *61A-2*
Bednar, Charles M., Electric Controller and Manufacturing Company, Division Square D Company, 4500 Lee Road, Cleveland 28, Ohio *7M-4*
Bedore, Harry S., Box 251, Sharon, Pennsylvania *24M-3*
Bedworth, David D., c/o Industrial Engineering Department, Purdue University, Lafayette, Indiana *35A-2*
Beever, E. W., Euclid (Great Britain) Limited, Newhouse Ind. Estate, Lanarkshire, Scotland *0M-3*
Begley, Charles L., 1405 B Pilot View Street, Winston-Salem, North Carolina *21A-2*
Begue, Jean B., 539 Brook Avenue, River Vale, Hillsdale P.O., New Jersey *61A-2*
Behle, Edgar H., 1175 Warson Woods Dr., Kirkwood 22, Missouri *16M-4*
Beiley, Irving, Ansco, Charles Street, Binghamton, New York *96M-3*
Belcher, Herbert R., 1733 Milford Street, Houston 6, Texas *22M-4*
Belford, Earl K., 546 Rosewood Drive, Kirkwood 22, Missouri *16A-2*
Belge, Albert C., 370 Stillwell Avenue, Kenmore 23, New York *49M-3*
Belk, Franklin P., Jr., MR-14 Edgewood, Columbus, Georgia *0A-1*
Bell, Albert A., Chattanooga Royal Company, First and Delmar Streets, Chattanooga 6, Tennessee *54M-4*
Bell, Jimmie D., Mead, Johnson and Company, 2404 West Pennsylvania, Evansville 21, Indiana *88AF-4*
Bell, Larence F., 4240 Suzanne Drive, Palo Alto, California *37M-4*
Bell, Ralph W., Jr., 1120 Gordon Road, Lyndhurst 24, Ohio *7A-2*
Bell, Thomas L., Jr., 62 Stoneleigh Court, Rochester 18, New York *44N-4*
Bell, Vincent G. 111 Wells Drive, Utica, New York *85AF-4*
Bell, William K., 206 Center, c/o General Delivery, Itasca, Illinois *25M-4*
Beller, Ronald E., Trainee-Works Manager's Staff, Babcock and Wilcox Company, 201 Sterling Avenue, Barberton, Ohio *19A-1*
Bellinger, Edward E., 1220 Kendall Court, Walnut Creek, California *12M-4*
Belliveau, Leo R., Scovill Manufacturing Company, 99 Mill Street, Waterbury, Connecticut *97A-2*
Belt, Robert W., 1707 Twenty-ninth Street, Two Rivers, Wisconsin *45M-4*
Belzer, Oliver J., 375 Catalina Boulevard, San Diego 6, California *29A-3*
Benarey, Henry A., I. and C. E. Industrial Engineer, 8 Seebad Strasse, Gr. Glienike nr. Kladow, Berlin, West Germany *0M-3*
Benatar, Leo, 1205 Briarhills Drive, N.E., Atlanta 6, Georgia *6A-2*
Benator, Josiah V., 1415 La Chona Court, N.E., Atlanta 6, Georgia *6A-1*
Benco, Samuel P., Cleveland Graphite Bronze, 17000 St. Clair Avenue, Cleveland 10, Ohio *7AF-4*
Bender, David J., Johns-Mansville Fiber Glass Incorporated, 1810 Madison Avenue, Toledo 1, Ohio *36M-4*
Bender, Ernst J., 94-20 Van Wyck Boulevard, Richmond Hill 19, New York *5A-2*
Bender, Eugene L., 3333a Carson Road, Normandy 21, Missouri *16AF-4*
Benedict, John R., 9412 East Kennerly Street, Temple City, California *23A-1*
Benes, Joseph F., 722 Verne, San Antonio 21, Texas *39A-2*
Bengalli, N. K., 16, Pitha Street, Fort, Bombay, India *4M-S*
Benjamin, Clyde A., 2715 State Street, Butte, Montana *0A-1*
Bennett, Harvey D., 68 Griffin Road (Pinefield), Framingham, Massachusetts *30AF-4*
Bennett, Jerome V., P.O. Box 45, 30 Delaware Avenue, Milford, New Jersey *77A-2*
Bennett, Joel C., Jr., Office of Air Force Plant Rep., North American Aviation, Incorporated, 12214 Lakewood Boulevard, Downey, California *23A-1*
Bennett, John L., 5708 Caladium, Dallas, Texas *10A-1*
Bennett, Louis G., 3-410 Macassar Drive, Pittsburgh 36, Pennsylvania *3A-1*
Bennett, Richard L., 2001 South "L" Street, Fort Smith, Arkansas *84A-1*
Bennett, Roger Luddington, Purity Stores, Limited, Manager, Industrial Engineering, 1645 Rollins Road, Burlingame, California *12M-4*
Bennett, S. Henry, Jr., 636 Marshall Street, Salem, Virginia *81M-3*
Bennett, William V., Savannah Sugar Refining Corporation, P.O. Box 710, Savannah, Georgia *26A-3*
Bennington, Paul W., Chief Industrial Engineer, Steel Company, Wilcox Street, Hamilton, Ontario, Canada *87M-3*
Benson, Chester Oscar, 1339 West Thirtieth Street, Erie, Pennsylvania *51M-4*
Benson, Norman A., 3508 West Brandon Street, Seattle 6, Washington *20A-2*
Benson, William H., 2706 Millwood Drive, Newport News, Virginia *99A-2*
Benter, Clarence L., 5805 Northgrove Way, Citrus Heights, California *43A-2*
Bentley, Louis E., 943 College Avenue, Columbus 9, Ohio *1A-2*
Bentley, William D., 10217 North East Twentieth Place, Bellevue, Washington *20A-2*
Bentley, Wilson J., School of Industrial Engineering and Management, Oklahoma Institute of Technology, Agriculture and Mining College, Stillwater, Oklahoma *15M-3*
Benton, William C., Jr., 2 North Ash, Hobart, Indiana *53A-1*
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Bizzell, LeRoy A., United States Pipe and Foundry Company, Twenty-seventh and Chestnut Street, Chattanooga 2, Tennessee *54A-2*
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Black, Duane A., 3511 Harriet Avenue, South, Minneapolis 8, Minnesota *38A-2*
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Blackburn, Kenneth G., 1401 South Elliott, Evansville, Indiana *88A-2*
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Blackwell, Paul H., Wolverine Tube, Division of Calumet and Hecla, Incorporated, Decatur, Alabama *69M-4*
Blagg, Lester L., 3924 Summit Ridge, Dallas 16, Texas *10A-3*
Blaine, James W., 3180 David Avenue, Palo Alto, California *37M-4*
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Blair, Paul D., 252 Alameda Avenue, Youngstown 4, Ohio *24M-3*
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Blankenship, James M., 7017 Kirby Crescent, Norfolk, Virginia *99A-2*
Blankenship, John R., 5732 West Monterosa Street, Glendale, Arizona *70AF-4*
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Blatchley, Melbourne W., 1747 Beeler, Aurora, Colorado *32A-1*
Blauser, John R., R.R. #1, Lebanon, Pennsylvania *71M-4*
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Bloom, Joel N., 614 Yale Avenue, Swarthmore, Pennsylvania *31A-2*
Bloom, Raymond Roll, 310 Gwen Drive, York, Pennsylvania *72M-4*
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Blosser, Robert Wilson, 5829 North Bay Ridge Avenue, Milwaukee 17, Wisconsin *45M-4*
Blossom, Robert J., Skyview Acres, Pomona, New York *61A-2*
Bluestein, Paul H., 3420 Section Road, Cincinnati 37, Ohio *8M-4*
Blum, Herbert, 2251 Plumb First Street, Brooklyn 29, New York *5A-2*
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Bobo, Ned, Production Manager, Lyman, South Carolina *0M-3*
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Bollinger, Fritz R., 244 Gay Lussac, Arvida, Quebec, Canada *0M-3*
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Booth, J. V., 887 West Roosevelt, Baton Rouge 2, Louisiana *41A-1*
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Bowman, Henry L., 121 S. Pickard, Norman, Oklahoma *57A-2*
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Breeze, Harry P., Western Electric, Burlington, North Carolina *66M-3*
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Burke, John G., 1842 West 189th Street, Homewood, Illinois *25M-4*
Burke, Maurice W., 415 West Thirty-eighth, San Mateo, California *37M-4*
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Carlisle, Harry L., General Motors Corporation, BOP Assembly Division, Doraville, Georgia *6M-4*
Carlock, Robert C., 2124 Cypress Street, Kingsport, Tennessee *17A-3*
Carlson, Carl E., 24 Bushee Street, Attleboro, Massachusetts *30A-2*
Carlson, Eric A., 1119 South Berry Road, Webster Groves, Missouri *16M-4*
Carlson, E. Rolland, 1209 Newland Avenue, Jamestown, New York *51A-2*
Carlson, Howard C., The United States Time Corporation, Municipal Airport, Little Rock, Arkansas *84A-1*
Carlson, John G., School of Business Administration, University of California, Los Angeles 24, California *23M-4*
Carlson, Raymond M , 36 Ward Avenue, New Middletown, Ohio *24A-1*
Carlson, Robert H., 5823 Kimberley Road, Fort Wayne, Indiana *34A-1*
Carlson, Robert W., 1528 Parkland Drive, Bettendorf, Iowa *46A-2*
Carlton, Cranfill A., 113 Edith, Irving, Texas *10A-3*
Carlton, Dennis N., 3138 South 211th Street, Seattle 88, Washington *20A-2*
Carmichael, Cecil S., 1504 Wailuku Drive, Hilo, Hawaii *OM-3*
Carmitchell, Robert J., 732 South Plum Street, Lancaster, Pennsylvania *71A-2*
Carmody, Robert F., 2535 Buena Vista Way, Berkeley 8, California *37A-1*
Carney, John W., 142 Oakdale Avenue, Norristown, Pennsylvania *31M-4*
Caro, Ulrich F., Laurel Hill Drive, Pleasantville, New York *5AF-4*
Caroe, Kruuse, 1722 La Vereda, Berkeley, California *12AF-3*
Carpenter, Ford D., 9698 East Twenty-first Street, Tulsa 14, Oklahoma *15M-3*
Carpenter, James J., Morris Bean and Company, Yellow Springs, Ohio *2A-2*
Carpenter, Lorean E., 1305 Welch, Little Rock, Arkansas *84M-3*
Carpenter, William A., 84 Willow Lane, Vermilion, Ohio *OA-3*
Carr, Charles W., 934 Phillips, Wichita 6, Kansas *56A-2*
Carr, Francis A., Hartford Special Machinery Company, Hartford 12, Connecticut *75A-4*
Carr, Ivan H., Jr., 29 Flinn Drive, Wymberley, Savannah, Georgia *26A-1*
Carr, J. David, 141 Wolcott Drive, Youngstown, Ohio *24M-3*
Carr, J Patrick, Jr., Box 632, Unit 1, New Cumberland, Pennsylvania *72M-4*
Carr, Raymond A., 964 Cloverdale Drive, Mobile, Alabama *79A-2*
Carr, Ronald D., 179 Amherst Street, Nashua, New Hampshire *62A-2*
Carr, William J., 4907 Arrowhead Boulevard, Kokomo, Indiana *35A-2*
Carrabino, Joseph D., BAE 250, University of California, Los Angeles 24, California *23A-3*
Carrese, Angelo D., 3451 Kenmill, Riverside, California *78A-2*
Carrigan, John P., c/o Kimberly-Clark Corporation, P.O. Box 4666, Memphis 7, Tennessee *28A-2*
Carrington, William A., 362 High Street, Hampton, New Hampshire *62A-2*
Carroll, Clarence M., 1264 Dell Drive, Monterey Park, California *23AF-3*
Carroll, Frank T., Jr., College of Engineering, Louisiana State University, Baton Rouge 3, Louisiana *41M-3*
Carroll, James J., 19 McAuliffe Road, Randolph, Massachusetts *30M-4*
Carroll, Phil, Jr., Carroll, Russell and Company, P.O. Box 1123, Rome, Georgia *93A-2*
Carroll, Phil, 6 Crestwood Drive, Maplewood, New Jersey *61M-L*
Carroll, William E., Carroll, Russell and Company, 325 East Eleventh, Rome, Georgia *93M-4*
Carroll, William E., 1205 Floyd Avenue, Wasena, Roanoke 15, Virginia *81M-3*
Carruthers, John M., 46 Green Knolls Lane, Fairfield, Connecticut *82A-2*
Carson, Gordon B., 2125 Elgin Road, Columbus 21, Ohio *1M-4*
Carson, Lewis A., R.R. #4, Osage Drive, Kingsport, Tennessee *17A-1*
Carson, Lewis J., 5726 Southern Parkway, Louisville 14, Kentucky *18A-3*
Carson, Robert G., Jr., School of Engineering, North Carolina State College, Raleigh, North Carolina *66M-3*
Carstarphen, Orrin H., 4014 Bloomfield Drive, Macon, Georgia *55A-1*
Carstens, Edward J., 66 Clearview Drive, Pittsford, New York *44M-4*
Carter, Donald E., 5905 East One Hundred Second Street, Kansas City 34, Missouri *92A-2*
Carter, Fred T., 2369 Jefferson Avenue, Winston-Salem, North Carolina *21A-2*
Carter, George C., 50 Belmont Avenue, Long Beach, California *23A-1*
Carter, Paul E., 906 Eastman Road, Oakwood Market, Apartment 10, Kingsport, Tennessee *17A-1*
Carter, Raleigh W., Jr., 3265 A Wakefield Road, Harrisburg, Pennsylvania *95A-2*
Carter, Richard L., Department of Industrial Engineering, Illinois Institute of Technology, Chicago 16, Illinois *25A-1*
Carter, Robert J., 1719 El Rito, Glendale, California *23A-1*
Carter, Tod F., 128 West Pennsylvania, San Diego 3, California *29M-3*
Cartmel, Franklin B., Armstrong-Norwalk Rubber Corporation, Norwalk, Connecticut *82A-2*
Cartwright, Dana E., Jr., 149 Chicago Avenue, Marion, Ohio *0A-3*
Cartwright, James P., 434 Hochberg, Monroeville, Pennsylvania *3A-1*
Carty, C. W., 438 Carrollton Drive, Frederick, Maryland *14M-4*
Carucci, Victor J., 38 Whitford Avenue, Whitesboro, New York *85A-2*
Caruso, Frank A., 5835 Washington Boulevard, Chicago 44, Illinois *25M-4*
Caruso, Vincent, Kaiser Aluminium and Chemical Corporation, Ravenswood, West Virginia *0M-3*
Carver, Charles J., 5214 Thirteenth Street, S.W., Canton 10, Ohio *19M-3*
Carver, John J., P.O. Box 593, Dragerton, Utah *50M-4*
Cary, Howard B., Hobart Brothers Company, Troy, Ohio *2M-4*
Casad, Arthur B., 224 San Miguel Way, San Mateo, California *12M-4*
Casciano, Peter F., U. S. Coast Guard Base, Box 2029, San Juan, Puerto Rico, *0A-1*
Casciari, Renato S., Lebanon Steel Foundry, Front and Lehman Streets, Lebanon, Pennsylvania *71M-4*
Case, William K., International Nickel Company, Incorporated, Huntington, West Virginia *58A-2*
Casey, Reginald H., 269 "D" Avenue, Coronado, California *29M-3*
Cash, Malcolm E., Box 4525, University, Alabama *9A-2*
Cashin, Bernard J., Scott and Williams, Incorporated, 266 Union Avenue, Laconia, New Hampshire *63A-1*
Cashion, James W., 3386 West Tanforan Drive, Littleton, Colorado *32A-1*
Cashman, Richard J., 147 Vila Nveva Court, Mountain View, California *37A-3*
Cashman, Robert M., 4443 Youngstown Road, S.E., Warren, Ohio *24M-3*

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Cashton, Sidney, 6 Chatham Street Extension, Malden 48, Massachusetts *30M-4*
Casper, Charles R., 13 Redwood Circle, Pensacola, Florida *33A-1*
Casper, Donald M., 1991 Penfield Road, Penfield, New York *44A-4*
Cassani, Charles C., 908 Migra, Chula Vista, California *29AF-3*
Cassel, Arno, 514B Glen Echo Road, Philadelphia 19, Pennsylvania *31M-4*
Cassel, Jean C., 420 Little York Road, Dayton 4, Ohio *2A-2*
Castle, Robert L., Reynolds Metals Company, Aluminum Extrusions and Tubing, Phoenix, Arizona *70M-4*
Casto, William N., 6218 Paseo, Kansas City, Missouri *92A-2*
Catalano, Philip A., 44 Coolidge Street, Methuen, Massachusetts *62A-2*
Cataldi, Cosimo L., 13103 South Arcturus Avenue, Gardena, California *23A-1*
Cather, Harlow H., 3716 Cork Place, Fort Worth 16, Texas *10M-3*
Cathon, Edwin J., 3217 Malvern Court, N.W., Canton 9, Ohio *19AF-3*
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Caudill, Chalmer B., 1108 Midland Boulevard, University City 5, Missouri *16A-2*
Cavanah, James A., 3127 Baker Drive, Concord, California *12A-2*
Cavanaugh, Joseph P., 114 Burdick Avenue, Hammonton, New Jersey *0A-1*
Cavanaugh, Thomas B., 516 Inlet Road, North Palm Beach, Florida *40A-1*
Cavanaugh, Vincent J., International Latex Corporation, Dover, Delaware *0M-3*
Cavaness, James E., 8915 Harry Hines Boulevard, Dallas 35, Texas *10A-1*
Cavell, George R., 6815 Edgebrook Drive, Springfield, Virginia *14M-4*
Caven, Melvin W., 407 North Alberta, Apartment B, Portland 17, Oregon *67A-1*
Cavendor, Marion N., Westinghouse Lamp Plant, Hoult Road, Fairmont, West Virginia *0M-3*
Caveney, James Joseph, 78 Burkham Court, Elm Grove, Wheeling, West Virginia *0A-3*
Caywood, Thomas E., 704 Argyle Avenue, Flossmoor, Illinois *25M-4*
Cazel, Hugh A., Western Electric Company, 204 Graham, Hopedale Road, Burlington, North Carolina *66M-3*
Cecere, Frank P., 405 South William Street, Johnstown, New York *0AF-3*
Cechanowicx, Alexander, 29225 Lorikay, Farmington, Michigan *47A-2*
Cecil, James W., 1320 Twenty-third Avenue Court, East Moline, Illinois *46M-4*
Cecil, Waldo E., 6306 Sudbury Street, Dallas 14, Texas *10A-1*
Cedro, Ted M., 238 Seventh Avenue, Bethlehem, Pennsylvania *77A-2*
Cedruly, Raymond, Box 3173, Glendale 1, California *23A-1*
Cejka, John R., 9217 Cherokee Drive, N.E., Albuquerque, New Mexico *59A-1*
Cellon, DeWitt, 1031 West Forty-seventh Street, Hialeah, Florida *40A-1*
Cermak, Charles J., 5001 Echo Valley Drive, N.W., North Canton 20, Ohio *19AF-3*
Chaban, Albert, 11605 De Pue Street, Philadelphia 16, Pennsylvania *31M-4*
Chaber, Morton D., Ronson Corporation of Pennsylvania, Delaware Water Gap, Pennsylvania *77M-4*
Chacko, I., Beacons Private Limited, United Bank of India Building, Pherozshah Mehta Road, Bombay-1, India *4M-S*
Chadha, Naranjan S., Chief Engineer and Manager, C. R. Mills Factory, 32-33 Imperial Hotel, Agra, U.P., India *0M-3*
Chafee, Robert S., c/o Mrs. B. Long, R.R. 2, Box 409, Winston-Salem, North Carolina *21A-2*
Chamberlain, Philip S., Winship Gardens, Apartment E-4, Macon Georgia *55A-1*
Chamberlin, Donald W., 357 Leonardville Road, Bedford, New Jersey *61A-2*
Chambers, Lawrence N., 3019 Jefferson, Davenport, Iowa *46M-4*
Chambers, Richard M., 2442 Crystal Lane, York, Pennsylvania *72AF-4*
Chambliss, Joel B., Lithia Springs, Georgia *6A-2*
Champion, George P., 3308 North Campus Avenue, Claremont, California *78A-2*
Champion, Sid S., Jr., 406 Carole Place, Vicksburg, Mississippi *0A-1*
Chandler, George W., 4007 San Andres, N.E., Albuquerque, New Mexico *59M-3*
Chandler, Harold J. H., Ernst and Ernst, 1356 Union Commerce Building, Cleveland 14, Ohio *7M-4*
Chane, George W., Vice President, Management Engineering, Radio Corporation of America, 30 Rockefeller Plaza, New York, New York *5M-4*
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Chapman, Dewey E., Jr., 530 South Kenosha, P.O. Box 127, Tulsa, Oklahoma *15A-3*
Chapman, Frank David, Simonds Saw and Steel, Intervale Road, Fitchburg, Massachusetts *30M-4*
Chapman, Jerry J., 414 West Meadow Brook Drive, Longview, Texas *60A-2*
Chappell, Hiram R., Jr., 2444 Boulevard Drive, N.E., Atlanta 17, Georgia *6A-2*
Chappelle, Richard C., 2200 Wright Avenue, Richmond, California *12M-4*
Charamsa, Zdzislaw C., Rosedale Terrace, R.R. 1, Long Sault, Ontario, Canada *0A-1*
Chari, E. N., Industrial Engineering Department, TISCO, Jamshedpur-1, India *4M-S*
Charles, Owen W., 826 Oakwood Avenue, Vallejo, California *12M-4*
Charles, Robert E., 212 Olive Road, Princess Anne, Virginia *99A-2*
Charlton, Robert L., c/o Allegheny Ludlum Steel, 1500 Jarvis, Ferndale 20, Michigan *47M-4*
Charnes, James I., Chief Industrial Engineer, Mellory Battery Company, North Tarrytown, New York *5A-2*
Chartrand, Eugene, 606 South Citron, Anaheim, California *23A-1*
Chase, John D., 410 La Rue Avenue, Endwell, New York *96A-1*
Chatto, Kenneth A., Kirkwood Apartments 4E, Camden 1, South Carolina *0A-1*
Chaveas, William F., 146 Locust Avenue, Springfield, Pennsylvania *31A-2*
Chavel, Frank E., 3562 Cold Spring Lane, Chamblee, Georgia *6M-4*
Chavez, Elias F., Jr., 3222 West Twenty-fourth Avenue, Denver 11, Colorado *32A-1*
Cheeley, William E., Reynolds Metals Company, c/o Product Development, Fifth and Cary Streets, Richmond 18, Virginia *0M-3*
Cheeseborough, Frank W., II, 405 Cedar Street, Augusta, Georgia *0A-1*
Chen, Ross, 314 West Seymour Street, Philadelphia 44, Pennsylvania *31M-4*
Chenault, Charles C., Jr., Shivel Drive, Hendersonville, Tennessee *73A-1*
Cheney, Thorndike F., 12 Labor-In-Van Road, Ipswich, Massachusetts *30M-4*
Cheney, William A., 314 Whitthorne Drive, Cincinnati 15, Ohio *8M-4*
Chenoweth, Edward A., 834 Blair Street, Salt Lake City 11, Utah *50A-2*
Cherkasky, Milton, 63 Edmonds Street, Rochester 7, New York *44A-2*
Cherner, Harold, 53 Rochester Road, Newton 58, Massachusetts *30A-4*
Cherney, Hans C., 2 Muldowney Circle, Poughkeepsie, New York *76A-2*
Cherry, Robert B., 53 Randolph Place, West Orange, New Jersey *61A-2*
Chervenak, Donald J., Lambert-Hudnut Company, 400 West Lincoln Avenue, Lititz, Pennsylvania *71A-2*

Cheshire, Leonard P., 3920 South West Twentieth Street, Gainesville, Florida *27A-2*
Chester, William M., Jr., The Heil Company, 3000 West Montana Street, Milwaukee 1, Wisconsin *45M-4*
Chew, Frank S., 1259 Linden Avenue, Macon, Georgia *55A-1*
Chew, Rowland, 2408 Mira Vista Drive, El Cerrito, California *12A-2*
Chiado, Donald A., 943 Lilly Lane, Pittsburgh 21, Pennsylvania *3A-1*
Chilcott, William F., 4343 Clairemont Mesa Boulevard, San Diego 17, California *29A-1*
Childress, Howard G., 122 South Hickory, Sapulpa, Oklahoma *15A-3*
Childress, John H., 8530 West Ninth Street, Wichita, Kansas *56A-2*
Chilman, Arthur L., 3174 Coolidge Avenue, Los Angeles 66, California *23M-4*
Chilson, Homer E., 124 Sasapequan Road, Fairfield, Connecticut *82M-4*
Chinn, Victor L., 1015 Myrtle Street, Oakland 7, California *12A-2*
Chinwala, Onally Aboulhusen, Cornell University, 304 College Avenue, Ithaca, New York *48M-3*
Chipak, Robert F., 313 Loren Avenue, Vestal, New York *96M-3*
Chisholm, Francis X., 622 East Liberty Street, Girard, Ohio *24A-1*
Chisholm, William D., 11229 East Danbury Street, Arcadia, California *23M-4*
Chittenden, George E., 532 Dunraven, Winter Park, Florida *27A-2*
Chock, Clinton, P.O. Box 148, Hakalau, Hawaii *0A-1*
Chowdhury, N., Industrial Engineering Department, TISCO, Jamshedpur-1, India *4A-S*
Christ, Philip T., Jr., Apartment 20-C-2, Sheridan Village, Schenectady 8, New York *0A-1*
Christensen, Gene W., Regional Industrial Engineering Manager, Montgomery Ward and Company, 75 Varick Street, New York 13, New York *86M-4*
Christianson, John V., Lolita Drive, MR 97, Binghamton, New York *96AF-3*
Christie, Theodore J., 78 Roosevelt Street, Cresskill, New Jersey *61A-2*
Christopher, Frank A., Jr., 5855 Monterey Road, San Jose 12, California *37A-1*
Chua, Richard O., 2159 Carolina Street, Malate, Manila, Philippines *0A-1*
Chuck, Robert S., 1000 V Street, Apartment 7, Sacramenta 18, California *43A-2*
Chun, Raymond K. Y., 1174 Huff Street, San Bernardino, California *78AF-4*
Chung, Jung K., 14 Bradford Road, Old Bridge, New Jersey *5A-2*
Church, David P., 644 Boulevard East, Weehawken, New Jersey *5M-4*
Church, Russell D., 2207 Norside Drive, Alton, Illinois *16AF-4*
Church, Thomas A., 2901 Van Buren, Dubuque, Iowa *0A-1*
Churchill, Frank A., P.O. Box 93, Fallbrook, California *29A-3*
Chyung, Myung Cho, 110 Nesudong Chongrokij, Seoul, Korea *0A-1*
Ciampa, Vincent A., P.O. Box #55, Bethpage, New York *86A-2*
Cigna, Jerome P., 186 Rye Road, Rochester 15, New York *44A-2*
Cincurak, Andrew, 1708 Marigold Avenue, Akron 19, Ohio *52A-2*
Ciolek, Chester H., 12911 Edmonton Avenue, Cleveland 8, Ohio *7A-4*
Cipriano, Charles R., 645 Devon Street, Kearny, New Jersey *61A-4*
Ciranna, Thomas P., R.R. #3, Pinehurst Way, New Castle, Pennsylvania *24M-3*
Cisler, John P., 3065 South High, Denver 10, Colorado *32A-3*
Clack, Richard L., 8 Fourth Avenue, East Rockingham, North Carolina *66A-1*
Claeys, Marvin, United Air Lines, 5959 South Cicero Avenue, Chicago 38, Illinois *25M-4*
Clair, Martin L., 412 Atlantic Avenue, York, Pennsylvania *72A-2*
Claire, Frank V., 4943 North Diversy Boulevard, Milwaukee 17, Wisconsin *45M-4*
Clam, Ronald, 8 Glenwood Avenue, Methuen, Massachusetts *62M-4*
Clapham, Lawrence P., 4410 Paseo De Las Tortugas, Torrance, California *23A-1*
Clark, Alfred W., 5152 Hermosa Avenue, Los Angeles 41, California *23A-1*
Clark, Charles E., Jr., Ernst and Ernst, 1300 First National Building, Birmingham, Alabama *9M-4*
Clark, Christopher T., 518 South Main Street, Niles, Ohio *24M-3*
Clark, Donald R., c/o Continental Pipe Line Company, Ponca City, Oklahoma *0A-1*
Clark, Earnest R., 658 Temple Street, Long Beach 14, California *23A-1*
Clark, Eugene E., 3347 Arkansas, Wichita 4, Kansas *56A-2*
Clark, Gerald E., Wayne State University, Detroit 2, Michigan *47M-4*
Clark, Gordon M., 127 Montezuma Avenue, Barstow, California *78A-2*
Clark, Jerry A., 175 Fourth Street, N.W., Atlanta, Georgia *6A-2*
Clark, Lyle C., United States Naval Air Station, South Weymouth, Massachusetts *30A-4*
Clark, N. R., Jr., Valley Mould and Iron Corporation, Hubbard, Ohio *24M-3*
Clark, Raymond W., 1212 Childers Drive, N.E., Albuquerque, New Mexico *59A-1*
Clark, Robert C., Industrial Engineer, Raytheon Manufacturing Company, 150 California Street, Newton, Massachusetts *30AF-4*
Clark, Russell B., 459 West Fifty-fifth Place, Gary, Indiana *53A-1*
Clark, Stanley D., 449 East Henry, Meadville, Pennsylvania *51M-4*
Clark, Vergil B., 503 Gilchrist Street, College Station, Texas *60M-4*
Clark, Warren R., Box 151, Ocoee, Florida *27A-2*
Clarke, C. Howard, Ansco, Division of General Aniline and Film Corporation, Binghamton, New York *96A-1*
Clarke, Charles R., Jr., 4604 Maine Avenue, Baltimore 7, Maryland *42A-2*
Clarke, Edward, 2812 West Thirty-eixth Street, Chicago 32, Illinois *25M-4*
Clarke, Robert E., 265 Fifth St., Silvis, Illinois *46A-2*
Clarke, Wiliam A., Jr., 621 A Pinecrest Circle, Marietta, Georgia *6A-4*
Claugus, Harold W., 1151 Los Molinos Way, Sacramento 25, California *43M-4*
Clawson, Lester F., 5555 South, 2000 West, Roy, Utah *50M-4*
Clayton, Keith E., 5834 Melshine, Dallas, Texas *10A-1*
Cleary, John W., P.O. Box 1076, Austin 66, Texas *0A-3*
Clegg, Lee M., Jr., 13705 Shaker Boulevard, Cleveland 20, Ohio *7A-2*
Clein, Robert B., 2263 Clairmont Road, N.E., Atlanta, Georgia *6A-2*
Cleland, Robert R., 65 Helenwood Road, Rochester 16, New York *44A-2*
Clement, David E., Lake Road, R.R. #1, Seneca Falls, New York *0M-3*
Clements, Beryl E., Box 4398, University, Alabama *9A-2*
Clements, John A., General Electric Company, Box 237, R.P.A., Detroit 32, Michigan *47A-2*
Clements, Robert C., 6027 Olive, Lakewood, California *23A-1*
Cleveland, Robert L., Jr., Raybestos-Manhattan, Incorporated, Raybestos Division, 75 East Main Street, Stratford, Connecticut *82A-2*
Clews, Handford B., 470 Niantic Avenue, Daly City, California *37A-1*
Click, Loring H., 936 Signal Road, Signal, Mountain Tennessee *54A-2*
Cliff, Arthur F., 2510 Richard Avenue, Mobile, Alabama *79M-4*
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Cline, Frederick A., Jr., 409 Cheltena Avenue, Jenkintown, Pennsylvania *31M-4*
Cline, Robert L., c/o Kerr-McGee Oil Company, Grants, New Mexico *57A-2*

Cloud, Fenton R., Curtis Publishing Company, Sixth and Walnut Streets, Philadelphia 5, Pennsylvania *31M-4*
Cloud, Franklin H., P.O. Box 142, Western Springs, Illinois *25A-1*
Cloutier, Richard F., Box 577, Salem Depot, New Hampshire *62A-2*
Clow, Howard P., 623 North Seventh Street, Burlington, Iowa *46M-4*
Cloyd, James G., 11600 South Burley, Chicago, Illinois *25M-4*
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Clutter, Curtis J., 213 Chalfant Avenue, Whitaker, Pennsylvania *3M-3*
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Coats, Roy R., 1449 West Oak Avenue, Fullerton, California *78A-2*
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Cobun, William R., 1006 Sunrise Drive, Whittier, California *23A-3*
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Cochran, Gene B., Buckeye Cellulose Corporation, Box 55, Macon, Georgia *55A-1*
Cochran, Leonard L., Jones and Laughlin Steel Corporation, Hamilton Street and City Park Avenue, Toledo 1, Ohio *36A-2*
Cochran, Phillip S., 216 Taft Street, Gary, Indiana *53M-3*
Cochran, William B., 16704 Second Place South, Seattle 88, Washington *20A-2*
Cochran, William M., Aluminum Company of America, East State Street, Lafayette, Indiana *35A-2*
Cochrane, Emmett L., P.O. Box 6234, Jacksonville 5, Florida *27M-4*
Cochrane, John B., Stromberg Time Corporation, Thomaston, Connecticut *97M-4*
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Cogsdill, Glen H., 48449 West Nine Mile Road, Northville, Michigan *47AF-4*
Cohen, Arthur L., 2548 Kelton, Los Angeles 64, California *23A-1*
Cohen, Harold, 1216 Wellington Street, Philadelphia 11, Pennsylvania *31A-2*
Cohen, Leon A., 41-20 Forty-sixth Street, Long Island City 4, New York *5M-4*
Cohen, Neil H., 377 Cornwall Street, Hartford, Connecticut *75A-2*
Cohen, Sidney J., Ronson Corporation of Pennsylvania, Delaware Water Gap, Pennsylvania *77M-4*
Cohn, Burton R., 4460 Ethel Avenue, North Hollywood, California *23A-3*
Cohn M. Leonard, 340 West Fifty-seventh Street, New York 19, New York *5M-4*
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Coker, Billy F., 1208 North Locust, Denton, Texas *10A-1*
Colakoglu, Erdem, 668 Alvarado, Stanford, California *37A-1*
Colburn, Alvin, 11525 Farndon, Los Altos, California *37M-4*
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Cole, David E., 1 Cullens Run, Pittsford, New York *44AF-4*
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Cole, William R., Jr., c/o Model Sportswear, Shelbyville, Tennessee *73A-1*
Colegrove, Clell D., Deere and Company, 3300 River Drive, Moline, Illinois *46M-4*
Coleman, Clarence Robert, Shop Engineer, Norfolk and Western Railroad, Roanoke, Virginia *81AF-3*
Coleman, Clyde T., 6311½ Montezuma Road, San Diego 15, California *29AF-3*
Coleman, Daniel B., 10710 Santa Monica Boulevard, Los Angeles 25, California *23M-4*
Coleman, Earl E., Country Club Drive, Monson, Massachusetts *94M-4*
Coleman, Edward P., 10556 Strathmore Drive, Los Angeles 24, California *23M-4*
Coleman, John, 5715 Free Pike, Dayton 26, Ohio *2M-4*
Coleman, Roy L., Jr., 3701 Overton Park, Fort Worth 9, Texas *10A-3*
Coley, L. Orval, Jr., 1225 Stoneridge Drive, Spring Valley, California *29M-3*
Colgan, Fred R., Jr., 11376 Orcas Avenue, San Fernando, California *23A-1*
Colgan, Ozro W., 31 West Bruceton Road, Pittsburgh 36, Pennsylvania *3M-3*
Colin, J. W., 870 Richmond Avenue, San Jose 28, California *37A-1*
Collett, R. E., 355 Brevard Avenue, Cocoa Beach, Florida *27A-2*
Colley, John L., Jr., 225-B Magnolia Street, Winston-Salem, North Carolina *21A-2*
Collin, Elbert M., 8319 Virginia Circle, South, Minneapolis 26, Minnesota *38A-4*
Collinge, Robert A., Riegel Textile Corporation, Trion, Georgia *93M-4*
Collino, Eugene A., 666 Borgess Avenue, Monroe, Michigan *36AF-4*
Collins, Donald L., Delco, Radio Division of General Motors, 700 East Firmin Street, Kokomo, Indiana *35A-2*
Collins, Edward L., 1020 Madison Avenue, Winston-Salem, North Carolina *21M-4*
Collins, Everett W., 1000 East Morgan Street, Kokomo, Indiana *35AF-4*
Collins, Jack W., 731 Inspiration Drive, San Antonio 1, Texas *39A-2*
Collins, Thomas E., Western Electric Company, 2525 North Shadeland Avenue, Indianapolis 6, Indiana *65A-2*
Colman, Julius, Jr., 3470 Syckelmoore, Trenton, Michigan *47A-2*
Colombo, Mario, Jr., 5523 Columbia, St. Louis 9, Missouri *16A-2*
Colon, Ernesto F., Industrial Engineering, University of Puerto Rico, Mayaguez, Puerto Rico *0A-1*
Colties, Jack S., 203 Prospect Street, Cambridge Springs, Pennsylvania *51A-2*
Columbus, Ellis N., 8601 Tunney Avenue, Northridge, California *23A-1*
Colvard, Harold, 4342 East Fifty-seventh Street, Tulsa, Oklahoma *15A-1*

Colvin, George L., 2711 Cullen Boulevard, Houston 4, Texas *22A-3*
Combs, Irwin W., Jr., 758 Berry, Memphis 17, Tennessee *28A-2*
Combs, Robert L., 2138 Roanoke Road, San Marino 9, California *23A-1*
Combs, Stephen A., 20451 Priday Avenue, Euclid 23, Ohio *7M-4*
Compton, Joe S., 802 McCardell, Channelview, Texas *22A-1*
Concha, Javier, Calle 4 Sur #19-51, Cali, Colombia, South America *0A-1*
Condi, Paul H., 5306 Elmhurst Drive, Evansville 11, Indiana *88AF-4*
Conelly, Allen E., 301 Thirteenth, Babbitt, Nevada *0AF-3*
Congleton, Vernon D., 3683 Mason, Memphis, Tennessee *28M-4*
Conley, Dennis L., 6011 Tomoka Drive, Orlando, Florida *27A-2*
Conley, George J., 934 Nobleshire Road, Cleveland Heights 21, Ohio *7A-2*
Connell, Robert P., 5299 Ocean Boulevard 10, Long Beach, California *23A-1*
Connell, William F., General Electric Company, 331 Broad Street, Utica, New York *85A-4*
Conner, James L., 701 West River Drive, Tampa 4, Florida *91A-2*
Conner, Roy E., 225 Spencer Avenue, Lancaster, Pennsylvania *71M-4*
Conner, William Ray, Jr., Acorn Pencil Company, 427 Depot, Shelbyville, Tennessee *73AF-3*
Connolly, Edward Charles, Jr., Whittier, Kingston, New York *76A-2*
Connolly, William E., 3130 Barbovos, Costa Mesa, California *23A-1*
Connor, Donald G., 2815 West Sixteenth Street, Brooklyn 24, New York *5AF-4*
Connors, Joseph E., 210 Monterey Place, Birmingham 9, Alabama *9M-4*
Connors, William P., 214 Seaton Road, Stamford, Connecticut *5A-2*
Conrad, Edward L., Mead Johnson and Company, 2404 Pennsylvania Street, Evansville 21, Indiana *88M-4*
Considine, John F., Ryan Aeronautical Company, Lindbergh Field, San Diego 12, California *29M-3*
Conton, Lee E., National Seal Division, Federal Mogul-Bower-Bearings, Inc., Redwood City, California *37M-4*
Converse, Wiles, Bausch and Lomb Optical Company, 635 St. Paul Street, Rochester 2, New York *44M-4*
Conway, James H., 3849 South Brust Avenue, Milwaukee 7, Wisconsin *45M-4*
Conway, Julius C., 2551 State Street, Granite City, Illinois *16A-2*
Conway, Leo, 285 Ayrault Road, Fairport, New York *44A-2*
Conway, Richard W., Cornell University, Sibley School of Mechanical Engineering, Ithaca, New York *48A-1*
Cook, Doreen, 197 Stamford Avenue, Stamford, Connecticut *82A-2*
Cook, Edward E., R.R. #2, Williamsport, Maryland *0A-3*
Cook, Edward W., 11802 Erwin, Cleveland 11, Ohio *7A-2*
Cook, George M., Box 844, San Bernardino, California *78A-2*
Cook, Herman L., R.R. #1, Clemmons, North Carolina *21M-4*
Cook, Ralph R., 1918 Harve Street, Missoula, Montana *0A-1*
Cook, Robert F., Chrysler Corporation, 2900 Shadeland Avenue, Indianapolis 6, Indiana *65M-4*
Cook, Walter H., 17411 Palora Street, Encino, California *23M-4*
Cook, Walton Y., 164 West Dixie Avenue, Marietta, Georgia *6A-2*
Cooley, Doctor L., Production Standards Specialist, OCAMA, P.O. Box 4674, Oklahoma City 9, Oklahoma *57A-2*
Cooling, Wilmer C., 368 Hillside Place, South Orange, New Jersey 61M-4
Coombs, Samuel J., Jr., 121 Lyons Road., Forestville, Connecticut *97A-2*
Coon, Clifton C., Jr., 31 Cedar Avenue, Newport News, Virginia *99A-2*
Cooper, Daniel, 10225 Lyndale Avenue, Minneapolis 20, Minnesota *38A-2*
Cooper, David D., Raytheon Manufacturing Company, Foundry Avenue, Waltham 54, Massachusetts *30M-4*
Cooper, Hiram W., Alcoa, P.O. Box 300, Bauxite, Arkansas *84A-1*
Cooper, Howard F., 3719 North Market, Shawnee, Oklahoma *57A-2*
Cooper, Howard R., Ronson Corporation of Pennsylvania, Delaware Water Gap, Pennsylvania *77A-2*
Cooper, Jerry O., 1512 Tenth Street, Wichita Falls, Texas *0A-1*
Cooper, Joseph M., 4 Prentice Avenue, Auburn, Massachusetts *68AF-3*
Cooper, Merle L., 1118 West Drive, Port Neches, Texas *0M-3*
Cooper, R. Conrad, Vice-President Industrial Engineering, United States Steel Company, Pittsburgh 30, Pennsylvania *3F-0*
Cooper, Raymond G., 1341 West Tenth Street, Erie, Pennsylvania 51A-2
Cooper, Robert K., 1554 West Coffman Avenue, Casper, Wyoming 32A-3
Cooperrider, Durwood L., 28308 Lincoln Road, Bay Village, Ohio *7M-4*
Cope, Wilfred C., 82 Riga Center Road, Churchville, New York *44M-4*
Cope, William S., American Enka Corporation, Morristown, Tennesee *11M-4*
Copeland, George C., 3010 Minnesota, Joplin, Missouri *0A-1*
Copeland, George F., 251 Raff Road, N.W., Canton 8, Ohio *19M-3*
Copeland, George M., Chagrin River Road, R.R. #3, Moreland Hills Village, Chagrin Falls, Ohio *7A-4*
Copeland, Robert V., Eli Lilly and Co., 740 South Alabama, Indianapolis 6, Indiana *65M-4*
Copenhefer, John E., Famco, Incorporated, 6200 Strawberry Lane, Louisville, Kentucky *18A-1*
Copp, Lowell J., Cincinnati Milling Machine Company, Cincinnati 9, Ohio *8M-4*
Coppage, John R., Jr., 159 Harben Place, Beechwood Hill, Athens, Georgia *0A-3*
Coppola, Joseph, General Electric Company, Armament and Control Section, Johnson City, New York *96A-1*
Corbett, Rufus E., Jr., 1537 Sharon Road, Winston-Salem, North Carolina *21 1-2*
Cordova, Albert L., 9109 Ronda Avenue, San Diego 11, California *29AF-3*
Cords, Edmond, Jr., Remington Rand, Division of Sperry Rand Corporation, P.O. Box 2674, Terminal Annex, Los Angeles 54, California *23AF-3*
Corlin, Sherwin W., 24620 Gardner, Oak Park 37, Michigan *47A-2*
Cornelius, Ira, P.O. Box 525, Inglewood, California *23A-1*
Cornelius, Robert E., Westinghouse Electric Corporation, 1216 West Fifty-eighth Street, Cleveland 2, Ohio *7A-2*
Cornell, Anthony R., 8813 Park Heights, Avenue, Garfield Heights 25, Ohio *7A-2*
Cornell, Arthur J., 107 Kingsway, Warner Robins, Georgia *55A-1*
Cornish, Miro, 2504 North Central Avenue, El Monte, California *23M-4*
Cornstuble, Herman L., 730 West Canterbury Road, University City 24, Missouri *16AF-4*
Corson, Barry A., 406 Craig Avenue, Tottenville, Staten Island 7, New York *5A-2*
Corwin, Ellera J., 3018 Carolina N.E., Albuquerque, New Mexico *59A-1*
Corwin, William W., 140 Vidal Boulevard, Decatur, Georgia *6A-2*
Cosme, Peter A., 2546 West One Hundred Ninth Place, Chicago 43, Illinois *25M-4*
Cossaboom, Roger A., 838½ Park Avenue, South Bend 16, Indiana *0A-1*
Cosson, Gustavo L., Calle Siete Quinta, URB Vista Alegre, Palmasula Caracas, Venezuela, South America *0A-1*
Costa, Vincent I., 805 Merrimac Circle, Chattanooga, Tennessee *54M-4*
Costanza, Robert R., 10525 South Van Ness #3, Inglewood 4, California *23A-1*
Costas, Andrew N., United States Steel, Homestead District Works, Munhall, Pennsylvania *3M-3*
Cote, Robert D., 834 Hill Avenue, Glen Ellyn, Illinois *25M-4*
Cotopoulos, Thomas, 127 Lidge Street, Nashua, New Hampshire *62A-2*
Cotter, Norman M., 602 Eighty-seventh N.E., Bellevue, Washington *20A-2*
Cottingham, Jack E., 2065 Kinnelo Canyon Road, Pasadena, California *23AF-3*

Couch, Robert F., 711 Harpur Drive, Endwell, New York *96M-3*
Couchois, Jack R., 4835 Mount Frissell, San Diego 17, California *29M-3*
Coughlan, Joseph D., Massey-Ferguson Limited, 915 King Street West, Toronto, Ontario, Canada *87AF-3*
Coughran, Joe F., 313 First Street, College Station, Texas *0A-1*
Coulter, Borden M., 127 Sinclair Avenue, Glendale 6, California *23M-4*
Courtney, Robert E., 756 Cosler Drive, Dayton 3, Ohio *2A-2*
Couts, Dixie W., 2002 Sunset Drive, Columbia, Tennessee *73A-1*
Coutto, G. J., Chief Industrial Engineer, Telco, Jamshedpur-4, India *4M-S*
CoVan, Jack P., R.R. #3, Box 10, Bryan, Texas *22M-4*
Cover, Millard W., 115 Rees Street, Playa del Rey, California *23A-1*
Coverdale, Hal M., 9032 Trask Avenue, Playa Del Rey, California *23M-4*
Covert, Maurice D., 1113 Cadle Avenue, Mentor, Ohio *7M-4*
Covich, William R., 1530 North Hanley Road, University City 14, Missouri *16A-2*
Cowan, Arnold A., 2755 Colby Avenue, Los Angeles 64, California *23M-4*
Coward, Bill M., Box 352, R.R. #1, Pine Ridge Road, Winston-Salem, North Carolina *21A-2*
Coward, James B., 38 Park Avenue, Brevard, North Carolina *83M-4*
Coward, Stuart D., Old Ceramic Building, North Carolina State College, Raleigh, North Carolina *66A-1*
Cowie, Robert A., Sperry Gyroscope Company, 135 Wickham Road, Garden City, New York *5A-2*
Cowles, Charles H., 2909 Jermain Drive, Toledo 6, Ohio *36A-2*
Cowles, Harold A., Jr., Iowa State University, Industrial Engineering Department, Ames, Iowa *0M-3*
Cox, Elmer A., 111 Oriole Lane, San Antonio 1, Texas *39A-2*
Cox, George D., R.R. #1, Box 216, Chesterton, Indiana *53M-3*
Cox, Harry A., 149 Michael, Santa Clara, California *37A-4*
Cox, John I., Jr., 2105 East Sevier Avenue, Kingsport, Tennessee *17A-3*
Cox, Thomas E., 74 Winding Way, West Orange, New Jersey *61AF-4*
Coxey, John Thomas, 3676 Curtis, Mogadore, Ohio *52M-4*
Craft, Carl B., 1215 York, Sheffield, Alabama *69A-4*
Craft, Clifford J., 34 South Franklin Avenue, Valley Stream, New York *5A-2*
Crafton, Don R., R.R. #2, Box 50, Harrisburg, Pennsylvania *95A-2*
Craig, Robert B., Porcelain Metals Corporation, 1400 South Thirteenth Street, Louisville 10, Kentucky *18M-3*
Craig, William H., 202 Bayless Avenue, Florence, Alabama *9A-2*
Cramer, Albert W., 1401 Lynnhurst Drive, New Castle, Indiana *0M-3*
Crandall, Max, 16714 Woodingham, Detroit 21, Michigan *47A-2*
Crandall, Richard E., Sylvania Electric Products, 100 Sylvan Road, Woburn, Massachusetts *30A-2*
Crandell, Edward O., 111 Ashley Drive, Palatka, Florida *27A-2*
Crandell, Jimmie W., 166 Ash Street, Park Forest, Illinois *25A-1*
Crane, Fred C., 8539 San Pedro Parkway, Dallas 18, Texas *10M-3*
Crane, Roger R., Touche, Niven, Bailey and Smart, 1292 National Bank Building, Detroit 26, Michigan *47M-4*
Cranmer, Clyde E., 321 Hazel Drive, Mount Lebanon, Pittsburgh 28, Pennsylvania *3M-3*
Cravens, Bill, East Maple Street, Paris, Arkansas *84A-1*
Cravey, David O., 7722 Rockhill Street, Houston 17, Texas *22A-1*
Crawford, H. F., 664 Rozelle, Memphis 4, Tennessee *28M-4*
Crawford, Kyle K., 621 North B Street, Arkansas City, Kansas *56A-2*
Crawford, Lewis A., 111 Encinal Drive, Red Bluff, California *0A-1*
Crawford, Lyle D., 407 Alstair Street, Pasadena, Texas *22A-3*
Crawford, Peter W., 44 Calle El Halcon, Camarillo, California *31A-2*
Crawford, R. H., c/o Mack Trucks, Incorporated, 1000 South Second Street, Plainfield, New Jersey *61M-4*
Crawley, Wayne O., 434 Marietta, Chula Vista, California *78M-4*
Creel, Joseph Sam, 1027 South Forty-second Street, Birmingham 5, Alabama *9M-4*
Creslein, William E., III, 836 Buttonwood Road, North Palm Beach, Florida *0A-3*
Cress, Richard H., 314 North Fourth Avenue, Arcadia, California *78A-2*
Creveling, John H., Jr., 1200 Settle Avenue, San Jose 25, California *37A-1*
Crider, John M., 1804 Hartman, Louisville 5, Kentucky *18AF-3*
Crimmins, John P., 1103 Manchester Drive, South Bend 15, Indiana *0M-3*
Cripe, Grayston M., General Electric Company, Building 26-2, 1635 Broadway, Fort Wayne, Indiana *34M-3*
Criss, Hubert O., 1008 Ray Avenue, Maryville, Tennessee *11A-2*
Crock, Frank P., 3030 South Colorado Boulevard, Denver 22, Colorado *32M-3*
Crocker, Angus M., 1052 Greenwood Drive, Menlo Park, California *37M-4*
Croft, Frank W., Seaboard, North Carolina *66A-1*
Croft, Luther G., Port Tobacco, Maryland *14A-2*
Cronin, R. B., 912 Thirty-fourth Street, Moline, Illinois *46A-2*
Crooke, James S., USOM, APO 271, American Embassy, New York, New York *5A-2*
Crooks, Earl P., 7210 Glades, St. Louis 17, Missouri *16A-2*
Crosby, Willis James, 734 Live Oak Avenue, Apartment 8, Menlo Park, California *37A-1*
Cross, Robert, 12 North Fairview Avenue, Allentown, Pennsylvania *77A-2*
Cross, Ronald L., 2504 West Locust, Davenport, Iowa *46A-2*
Crosskill, Jack F., 39 School Street, Lisbon Falls, Maine *0A-1*
Crossley, John F., 10559 Brotman Avenue, Arlington, California *78A-2*
Crosswhite, Charles L., 930 Fairview Drive, Bethany, Oklahoma *57AF-4*
Crouch, Ralph P., Joseph E. Seagram and Sons, Incorporated, 375 Park Avenue, New York 22, New York *5M-4*
Crouch, Ray M., 3244 Douglass, Garland, Texas *10M-3*
Crouse, Homer L., 714 Apple Tree Lane, Deerfield, Illinois *25M-4*
Crow, E. T., 29018 Wolf Road, Bay Village, Ohio *7M-4*
Crow, John T., 98 Westmont Avenue, Elmira, New York *48M-3*
Crowder, William L., 3417 West First Street, Winston-Salem, North Carolina *21A-2*
Crownover, Lewis S., Republic Steel Corporation, Room 410, Market Street, Youngstown 1, Ohio *24M-3*
Croysdale, W. E., 21026 Fairmount Boulevard, Shaker Heights 18, Ohio *7M-4*
Crum, Glenn R., 312 Maryland Avenue, Erie 2, Pennsylvania *51A-2*
Crumpler, Edwin Lowell, 13 Taylor Street, Berryville, Virginia *0A-1*
Crutchfield, James H., 152 Christian Avenue, Roanoke, Virginia *81A-1*
Cubbedge, Robert A., 3301 East Lincolnshire, Toledo 6, Ohio *36M-4*
Cuddigan, Robert W., 3354 West Washington, Englewood, Colorado *32M-3*
Cullen, Arthur T., 801 Wimbleton Drive, Raleigh, North Carolina *66A-1*
Culp, Charles E., 7117 Booth Place, Ft. Worth 18, Texas *10A-1*
Culver, Harold D., 6334 Orinoco, Indianapolis 27, Indiana *65A-2*
Cummings, Donald F., c/o Wilson Plastics, Temple, Texas *0A-1*
Cummings, E. William, Supervisor, Methods Engineering, Saginaw Steering Gear Division, GMC, 3900 Holland Road, Saginaw, Michigan *98M-4*
Cummings, Robert Jay, 1507 Spaulding Road, Magnolia Park, Savannah, Georgia *26M-3*
Cunningham, Edward L., 207 North Boyd, Sapulpa, Oklahoma *15A-3*
Cunningham, William D., 3481 Palmyra Road, S.W., Warren, Ohio *24A-1*
Cupp, Frank M., 8310 East Orme, Wichita 18, Kansas *56A-2*
Curlee, Walter E., H. C. Smith Oil Tool Company, P.O. Box 431, Compton, California *78A-2*
Curley, Robert G., Consolidated Freightways, Incorporated, 431 Burgess Drive, Menlo Park, California *37A-1*

Current, Kenneth A., 925 South Ninth Street, San Jose 12, California *37A-1*
Curry, John C., Jr., 211 Lawyers Building, Greenville, South Carolina *0A-1*
Curson, Harold R., P.O. Box 166, Louisville 18, Kentucky *18A-3*
Curtis, Charles F., Jr., 3220 Avenue E., Apartment D, Ensley, Birmingham, Alabama *9A-2*
Curtis, Clyde F., 24 Hobart Avenue, Short Hills, New Jersey *61M-4*
Curtis, George L., Mason and Hanger-Silas Mason Company, Incorporated, Pantex Ordnance Plant, P.O. Box 647, Amarillo, Texas *0AF-3*
Curtis, Joseph M., 17472 Norton Avenue, Lakewood 7, Ohio *7M-4*
Curtis, Robert H., 510 West Broadway, Goldendale, Washington *0A-1*
Cusack, Francis J., 10 Woerd Avenue, Waltham, Massachusetts *30A-2*
Cushing, John W., Eastman Kodak Company, Kodak Park Works, Rochester 4, New York *44M-4*
Cushman, Lee H., Jr., 1306 Woodland Street, Tullahoma, Tennessee *64M-3*
Cutler, Byron, Independent Perforators, Incorporated, P.O. Box 128, Stillwater, Oklahoma *57AF-4*
Cuturilo, George M., 2156 Eighth Street, Akron 14, Ohio *52M-4*
Cyr, Arthur R., Frankford Arsenal, Philadelphia 37, Pennsylvania *31M-4*
Czajkowski, Theodore S., 9 Jarvis Avenue, Syosset, Long Island, New York *86A-2*
Czarnecki, John R., 1498 Hertel Avenue, Buffalo 16, New York *49A-1*
Czartoski, Bernard Z., 3078 Kent Road, Stow, Ohio *52A-2*

Dabbs, James E., 930 Richland Drive, Memphis 16, Tennessee *28A-2*
Dabroski, Donald L., 1425 Hawthorne Street, Pittsburgh 1, Pennsylvania *3A-1*
Dabrowski, Richard A., 95 Main Street, Concord, Massachusetts *30A-2*
D'Acosta, Emil E., 3350 Creston Road, Ft. Worth 15, Texas *10A-3*
DaGue, Richard E., Iowa Ordnance Plant, P.O. Box 561, House #185-11, Burlington, Iowa *0AF-3*
Dahin, John B., P.O. Box 1151, Macon, Georgia *55A-1*
Dahlhaus, Frank J., Ordnance Management Engineering Training Agency, Rock Island Arsenal (Cost Center 1600), Rock Island, Illinois *46A-2*
Daiss, Leonard H., 1142 McKinley Avenue, Oakland 10, California *12AF-3*
Dalen, M. Edward, 4130 Arden Way, Sacramento, California *43M-4*
Dall, David G., 315 James Boulevard, Signal Mountain, Tennessee *54M-4*
Dallas, John J., 1055 W. Belvedere Circle, Mobile, Alabama *79A-4*
Dalphy, James G., 3341 Stewart Avenue, Los Angeles 66, California *23A-1*
Daly, John J., 18 Maine Avenue, Somerville 45, Massachusetts *30A-2*
Dambaugh, William E., 2334 Clark Avenue, Venice, California *23A-1*
Dame, Richard G., 719 Club Lane, Kirkwood 22, Missouri *16M-4*
D'Amelio, Anthony D., 209 Balsam Road, Hendersonville, North Carolina *83A-2*
Damroth, Michael, 465 Colfax Road, Havertown, Pennsylvania *31A-4*
Danahy, Raymond John, Republic Steel Corporation, 1175 South Park Avenue, P.O. Box 1000, Buffalo, New York *49M-3*
Dandalides, John P., March Electric Company, 725 Water Street, Cambridge, Ohio *52A-2*
Danek, James V., 413 Callan Avenue, Evanston, Illinois *25M-4*
Danford, D. H., 230 South West Thirtieth Avenue, Miami 35, Florida *40A-3*
Dangler, Edward, 1214 Manchester Street, National City, California *29A-1*
Daniel, Anthony M., 901 Shares Crest Road, Birmingham 9, Alabama *9A-2*
Daniel, Truman L., 9003 Matthew Avenue, N.E., Albuquerque, New Mexico *59A-1*
Daniels, George M., 34 Second Avenue, Auburn, New York *0M-3*
Daniels, Jerry G., 3730 Nautilus Avenue, Brooklyn 24, New York *5M-4*
Daniels, W. Drexel, 301 Gilmour Court, Apartment 201, Richmond 21, Virginia *0A-1*
Danielson, Donald E., 1548 Shelley Drive, Dayton 6, Ohio *2A-2*
Dantzler, Lorenzo N., c/o Mrs. W. M. Duncan, Inverness, Mississippi *0A-1*
Dar, H. L., Industrial Engineering Department, TISCO, Jamshedpur-1, India *4A-S*
D'Arcangelo, Edward J., Corning Glass Works, Walnut Street, Corning, New York *48A-1*
Dardwin, Louis J., 1581 Wittekind Terrace, Cincinnati 24, Ohio *8M-4*
Dargan, William E., Staff Industrial Engineer, Alcoa, Alcoa Building, Pittsburgh 19, Pennsylvania *3M-3*
Darling, Robert E., 6218 Oak Creek Way, Citrus Heights, California *43A-2*
Darmody, James E., 509 Samson Street, Redwood City, California *37A-1*
Darpino, Roy W., 1216 Front Street, Vestal, New York *96A-1*
Darragh, Ralph V., 1205 Concord Avenue, N.E., Massillon, Ohio *19M-3*
Darsow, Donovan W., 512 Newcomer Street, Richland, Washington *0A-1*
Daugh, Harry C., 53 Rutherford Place, Montvale, New Jersey *61M-4*
Daugherty, Lynn D., 8 Chauncy Street, South Weymouth, Massachusetts *30A-2*
Daughtrey, Lyman C., Jr., National Carbon Company, 1501 West State, Fremont, Ohio *36A-2*
Daum, Harold C., 628 South Prince, Princeton, Indiana *88AF-4*
Daum, Paul J., 48 Avon Road, Berkeley 7, California *12M-4*
Davey, John, Jones and Laughlin Steel Corporation, 3341 Jennings Road, Cleveland 1, Ohio *7M-4*
David, Webster, 404 West Twenty-second Street, Wilmington 2, Delaware *100A-1*
Davidson, Edward S., 6352 Eastwood Street, Philadelphia 49, Pennsylvania *31A-2*
Davidson, Harold O., Jr., 13 Oxford Street, Chevy Chase, Maryland *14M-4*
Davidson, James S., 7408 Ridgewood Avenue, Chevy Chase, Maryland *14A-2*
Davidson, James T., 18203 Highland Drive, Maple Heights, Ohio *7A-2*
Davidson, John H., 611 Park Building, Portland 5, Oregon *67M-3*
Davidson, Milton, Schermerhorn Drive, Ball Pond, RFD #4, Danbury, Connecticut *82A-2*
Davidson, Paul J., 5435 Argall Crescent, Norfolk 8, Virginia *99A-4*
Davies, Charles E., 209 Augusta Drive, North Syracuse, New York *13M-4*
Davies, Ralph R., 2618 Garcia, N.E., Albuquerque, New Mexico *59A-1*
Davies, Walter G., Jr., 140 Pallisades Drive, Signal Mountain, Tennessee *54A-2*
Davine, John P., 7309 Shisler Street, Philadelphia 11, Pennsylvania *31A-2*
Davis, Allan H., 18282 Kalvin Drive, Berea, Ohio *7AF-4*
Davis, Andrew J., Western-Electric Company, Lexington Road, Winston-Salem, North Carolina *21A-2*
Davis, Bill G., R.F.D. #1, Mill Spring Addition, Godfrey, Illinois *16A-2*
Davis, Byron E., 257 Hayes Avenue, N.E., Massillon, Ohio *19M-3*
Davis, Charles F., 1740 West First Avenue, Columbus 12, Ohio *1A-2*
Davis, Charles H., 369 River Road, Bogota, New Jersey *61A-2*
Davis, Charles S., 1010 Deckner Avenue, S.W., Atlanta, Georgia *6A-2*
Davis, Clayton L., Jr., 5456 A Lowe Street, Van Voorbis Manor, Ft. Knox, Kentucky *0A-1*

Davis, David, II, 25 Poland Manor, Poland, Ohio *24A-1*
Davis, Donald J., 4310 Miami Street, South Bend 14, Indiana *0A-3*
Davis, Donald L., 2493 East 4340 South, Salt Lake City 17, Utah *50A-2*
Davis, Durwood H., 426 Phillips, Seaford, Delaware *0A-1*
Davis, Ford R., 1225 Detroit Street, Napoleon, Ohio *36A-2*
Davis, Gene C., 165 Salisbury Street, Kernersville, North Carolina *21A-2*
Davis, George E., Jr., Edgar, Florida *27A-4*
Davis, George G., 4205 Rosedale Road, Middletown, Ohio *0M-3*
Davis, George Q., 31 Ames Street, Cambridge, Massachusetts *30M-4*
Davis, Harry L., 136 Southwood Lane, Rochester 18, New York *44M-4*
Davis, Hubert V., Jr., 98 Roswell Court, N.E., Atlanta 5, Georgia *6A-2*
Davis, James H., Aluminum Company of America, Alcoa Building, Pittsburgh 19, Pennsylvania *3M-3*
Davis, John, 1975 Titus Avenue, Rochester 22, New York *44A-4*
Davis, John D., Manufacturing Planner, Rohr Aircraft Corporation, Foot of "H" Street, Chula Vista, California *29A-1*
Davis, John D., IBM Corporation, North Street, Endicott, New York *96A-1*
Davis, John E., 454 Fifth Street, Ogden, Utah *50M-4*
Davis, John H., 34 Fairfield Street, Boston, Massachusetts *30A-2*
Davis, Joseph Iryl, Champion De Arment Tool Company, South Main Street, Meadville, Pennsylvania *51M-4*
Davis, Lawson C., c/o J. C. Vaughn, Powder Springs, Georgia *6A-2*
Davis, Lester A., 1307 West Tate, Kokomo, Indiana *35AF-4*
Davis, Lloyd H., 188 Boyd's Drive, Marietta, Georgia *6A-2*
Davis, Louie H., 2900 North West Ninth Street, Miami 35, Florida *40A-3*
Davis, Louis E., Industrial Engineering Department, University of California, Berkeley 4, California *12M-4*
Davis, Perry V., 844 Madeira Drive, S.E., Albuquerque, New Mexico *59A-1*
Davis, Reeves K., R.R. 3, Fairmont Road, Candler, North Carolina *83A-2*
Davis, Richard C., Freeport Road, R.D. 2, Northeast, Pennsylvania *51A-2*
Davis, Richard S., 2328 St. Mark's Way, Sacramento 21, California *43A-2*
Davis, Robert G., 4215 West Sixty-second, Los Angeles 43, California *23AF-3*
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Davis, Tommy M., 305 Third Street, Phillips, Texas . *0A-1*
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Davis, William F., 340 Watson Avenue, Lyndhurst, New Jersey *61A-2*
Davis, William R., 28 Warwick Road, Watertown 72, Massachusetts *30M-4*
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Deal, Robert B., 946 Curran Avenue, Kirkwood 22, Missouri *16A-2*
Deal, Walter J., 1247 Arcturus Lane, Mobile, Alabama *79A-2*
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Deaton, James R., 9112 Carlisle Avenue, Baltimore 6, Maryland *42M-4*
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Deisner, Virgil S., 9406 Morton Avenue, Cleveland 9, Ohio *7M-4*

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Ellefson, Keith Edward, Thompson, Iowa *0A-1*
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Feigenbaum, Simon, Jones and Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh, Pennsylvania *3M-3*

Feiman, Victor, 101 Ocean Parkway, Brooklyn 18, New York *5M-4*

Feimster, Maurice B., Johnsontown Place, Bel Alton, Maryland *14A-2*

Fein, Harris A., 245-03 Sixty-second Avenue, Douglaston 62, New York *5M-4*

Fein, Mitchell, 202 Saddlewood Drive, Hillsdale, New Jersey *5M-4*

Feinman, Herbert, 2398-B, West Lindmont Court, N.E., Atlanta 5, Georgia *5M-4*

Feist, Eliezer K., 118 Rothschild Boulevard, Petah, Tikva, Israel *0A-1*

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Feldman, George E., 629 Berger Street, Emmaus, Pennsylvania *77M-4*

Feldman, Jerome O., 97-07 Sixty-third Road, Rego Park 74, New York *5A-2*

Feldman, Louis, 1515 Kennedy Street, Hyattsville, Maryland *14M-4*

Feldmann, Howard U., 2525 South Sandusky, Tulsa, Oklahoma *15A-3*

Feleki, Elmer E., 1129 Vista Trail, N.E., Atlanta 5, Georgia *6A-4*

Feller, Charles L., Emerson-Pryne Company, 140 North Towne Avenue, Pomona, California *78A-2*

Fellin, Lawrence F., 205 Bellevue Drive, Pittsburgh 35, Pennsylvania *3M-3*

Fellman, Edward E., Sylvania Electric, 100 Sylvan Road, Woburn, Massachusetts *30A-2*

Fellows, Norman G., R.F.D. #2, Putnam, Connecticut *0A-1*

Felzer, William, 2925 Rivera Street, San Francisco 16, California *12M-4*

Fennimore, John E., 121 Hope Circle, Orlando, Florida *27A-2*

Feorene, Orlando J., 95 Upland Drive, Rochester 17, New York *44M-4*

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Ferguson, Walter T., 252 Harty Street, Yonkers 2, New York *5AF-4*

Ferguson, William M., 2916 Capitul, Fort Wayne, Indiana *34A-3*

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Ferst, Alvin M., Jr., Rich's, Incorporated, Broad and Alabama Streets, Atlanta 2, Georgia *6M-4*

Fessler, Carl G., Eastman Kodak Company, Kodak Park, Rochester 4, New York *44M-4*

Feuerpfeil, Wolfgang G., Giddings and Lewis Machine Tool Company, 142 Doty Street, Fond du Lac, Wisconsin *45M-4*

Feury, William A., 2110 Meadow View Road, Scotch Plains, New Jersey *61A-2*
Fick, Lawrence G., 3141 South Harlem Avenue, Berwyn, Illinois *25A-1*
Fiddlke, Arthur J., 12031 Harvard Avenue, Chicago 28, Illinois *25A-1*
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Figh, Lewis H., Jr., 2476 LeRuth Avenue, Montgomery 6, Alabama *0A-3*
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Filimon, Victor D., 25240 Brydon Road, Cle[illegible]nd 22, Ohio *7M-4*
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Filsinger, Alfred C., Yale Rubber Manufacturing Company, Limited, Kincardine, Ontario, Canada *87A-1*
Filson, Rogers C., Phillips Petroleum Company, Bartlesville, Oklahoma *0A-1*
Finch, Robert L., Westinghouse Electric Corporation, 401 Liberty Avenue, Pittsburgh 30, Pennsylvania *3M-3*
Findeis, Virginia M., 241 Temple Road, Waltham 54, Massachusetts *30A-2*
Fine, Gerald T., 606 West Creek, Lindsay, Oklahoma *0A-1*
Fine, Leonard H., 83 East Prospect Street, Waldwick, New Jersey *61M-4*
Fink, Chester F., 17 Birkdale Road, Buffalo 25, New York *49A-1*
Fink, Donald L., 1302 East Thirty-fifth Street, Baltimore 18, Maryland *42A-2*
Fink, Leon G., 57 Beltran Street, Malden, Massachusetts *30A-2*
Fink, Norman S., 321 South Robertson Boulevard, Beverly Hills, California *23M-4*
Finke, Roger A., 426 Madison Avenue, Apartment 10, Redwood City, California *37A-1*
Finke, William C., 1 Colchester Drive, Ferguson 21, Missouri *16M-4*
Finley, Arley D., Jr., 203 North Tallahassee Street, Hazlehurst, Georgia *0A-1*
Finley, Ben G., 1520 South Thirty-first Street, Decatur, Illinois *80AF-4*
Finley, Robert E., Puget Sound Naval Shipyard Bremerton Washington *20A-2*
Finn, Charles G., 1220 Powers Drive, Tyler, Texas *60A-2*
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Firrantello, Thomas, 25 Newtown Avenue, Stratford, Connecticut *82A-2*
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Fischer, Fred C., Line Material Company, 2201 Twelfth Avenue, South Milwaukee, Wisconsin *45A-2*
Fischer, Joseph P., 3226 Cottman Avenue, Philadelphia 49, Pennsylvania *31A-2*
Fish, Edward Russell, Jr., R.R. 2, Box 5191, Issaquah, Washington *20M-4*
Fish, Hy, 1361 East Fifty-second Street, Chicago 15, Illinois *25M-4*
Fishburn, Peter C., 733 Mckee Street, State College, Pennsylvania *89A-2*
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Fisher, Carl F., RD 1, Box 171E, Warren, Pennsylvania *0A-1*
Fisher, Earl M., Box 484, Benwood Hill Road, Benwood, West Virginia *0A-1*
Fisher, James F., 331 South Lafayette Park Place, Los Angeles 57, California *23M-4*
Fisher, Joseph G., 902 West Third Street, Lock Haven, Pennsylvania *89A-2*
Fisher, Michael C., 4203 East Twelfth Place, Gary, Indiana *53A-1*
Fisher, Morton S., 1333 East Sedgwick Street, Philadelphia 50, Pennsylvania *31A-2*
Fisher, Othel A., 389 East Main, Geneva, Ohio *7A-2*
Fisher, Philip Eugene, United States Army Chemical Corporation, Engineering Comm., Army Chemical Center, Maryland *42M-4*
Fisher, Samuel Scott, River Road, R.D. 1, Milton, Pennsylvania *89M-3*
Fisher, Vernon D., 11269 Pope Avenue, Lynwood, California *23A-1*
Fishman, Donald David, 41 Evelyn, Mattapan 26, Massachusetts *30M-4*
Fishman, Herbert C., 10 Ames Road, Marblehead, Massachusetts *30A-2*
Fishman, William, 19012 Schoenborn, Northridge, California *23A-1*
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Fissinger, Richard M., 758 Hayes, Gary, Indiana *53M-3*
Fitz, Robert E., Lynchburg Foundry Company, Radford, Virginia *81M-3*
Fitzgerald, Arthur E., 16967 Calahan Street, Sepulveda, California *23A-3*
Fitzgerald, John P., Merck and Company, Incorporated, Lincoln Avenue, Rahway, New Jersey *61A-2*
Fitzgerald, William J., 2534 West Swain Road, Stockton 7, California *12M-4*
Fitzgibbons, John, 20727 Applegate, Maple Heights 37, Ohio *7A-2*
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Fitzwilson, R. E., 4117 Morgan Road, Tucker, Georgia *6M-4*
Fix, Ralph F., 552 East Warner Road, Akron 19, Ohio *52A-4*
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Flame, Lowell, c/o Maidenform Bra Company, 154 Avenue "E" Bayonne, New Jersey *5A-2*
Flanagan, James R., 1520 Grant Court, Peru, Illinois *80AF-4*
Flanagan, William F., 140 Redder Avenue, Dayton 5, Ohio *2M-4*
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Flanders, Daniel E., 5728 Sunset Street, Fort Worth 16, Texas *10A-3*
Flanders, Merle D., Signal Manufacturing Company, 47 Congress Street, Salem, Massachusetts *30M-4*
Fleischer, Gerald A., 1934 Capitol, Apartment 22, Palo Alto, California *37A-1*
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Flight, Curtis H., 31 Aberdeen Road, Milton, Massachusetts *30A-2*
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Floriani, Joseph D., 2007 St. Elmo, N.E., Canton 4, Ohio *19M-3*
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Flowers, Leon E., 4820 Rexwood Drive, Dayton 39, Ohio *2A-2*
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Fodo, Joseph A., 842 Nemet Drive, Seven Hills 31, Ohio *0A-1*
Foehringer, Harry J., 20000 Beachview Drive, Cleveland 17, Ohio *7M-4*
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Fogarty, William J., 64 Howard, Saugus, Massachusetts *30M-4*
Fogel, Herman M., E. I. duPont de Nemours and Company, Savannah River Plant, Aiken, South Carolina *0M-3*
Fogel, Jerome J., 144 Fieldmere Street, Elmont, Long Island, New York *86M-4*
Foley, Francis J., Senior Industrial Engineer, Corporate Staff, Raytheon Manufacturing Company, 429 Watertown Street, Newton 58, Massachusetts *30M-4*
Foley, Robert F., Industrial Engineer, H. P. Hood, W/S Department, 56 Roland Street, Charlestown, Massachusetts *30AF-4*
Fong, Phyllis A., Apartado 4579, Estafeta Justo Arosemana, Panama, Panama *0A-1*
Foote, Merrill J., Apt. C, 204 Hoosier Courts, Bloomington, Indiana *25A-1*
Foote, Spencer T., Jr., 3961 South 51, Milwaukee 19, Wisconsin *45A-2*
Forberg, Richard A., Procter and Gamble Company, M. A. and R. Building, Cincinnati 17, Ohio *8M-4*
Forbus, William R., Jr., 410 Clay Street, Alexander City, Alabama *0A-1*
Ford, Charles L., Sprayers and Nozzles, Incorporated, 2575 Twenty-eighth Avenue, N., St. Petersburg 13, Florida *91M-4*
Ford, David R., 318 South Butler Avenue, Indianapolis 19, Indiana *65AF-4*
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Ford, Prather A., Jr., Ramsey Corporation, Manchester and Weidman Roads, Manchester, Missouri *16AF-4*
Ford, Robert C., Armco Drainage and Metal Products, P.O. Box 1699, Houston 1, Texas *22M-4*
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Forry, James W., 10446 Deerfield Road, Cincinnati 42, Ohio *8A-4*
Forssell, Leroy E., 10101 Rhodes Avenue, Chicago 28, Illinois *25M-4*
Forstall, Thomas B., 400 McClellan Drive, Pittsburgh 36, Pennsylvania *3A-1*
Forsyth, George R., c/o Wolverine Tube, Box 758, London, Ontario, Canada *87A-1*
Forsyth, John G. M., 17477 Cleveland Road, South Bend, Indiana *0M-3*
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Forsythe, Thomas G., 3719 Beacon Drive, Village of Beachwood, Ohio *7A-4*
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Fortgang, Milton, 92 Linden Boulevard, Hicksville, New York *5A-4*
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Fortune, W. Jan, 238 Custer Avenue, Evanston, Illinois *25M-4*
Foss, Oliver A., 1636 South Beverly Glen, Apartment 15, Los Angeles 24, California *23A-3*
Foster, Charles G., 58 Turgeon Avenue, Dracut, Massachusetts *62M-4*
Foster, Jerry L., 4460 Euclid, San Diego 15, California *29AF-3*
Foster, Robert Craig, 1025½ South Woods Avenue, Los Angeles 22, California *23A-1*
Foster, Robert R., Libbey Owens Ford Glass Company, Box 4278, Fifty-seventh Street, Charleston 4, West Virginia *58A-2*
Foster, Thomas E., 2100 Ridgeway Street, S.W., Huntsville, Alabama *69M-4*
Foster, Vernon D., 3010 South Columbus Street, Arlington 6, Virginia *14M-4*
Foster, Walter, 4730 Jefferson, Gary, Indiana *53M-3*
Foster, Walter J., 4119 Kensington Avenue, Tampa 9, Florida *91A-2*
Fotter, Millard Joseph, 245 Del Mar Court, San Luis Obispo, California *23M-4*
Fougner, Thorstein E., 2143 Denham Avenue, Columbia, Tennessee *73A-1*
Fournet, Dewey J., Jr., 4934 Inniswold Road, Baton Rouge 6, Louisiana *41A-1*
Fourqurean, William E., 220 Topaz Street, New Orleans 24, Louisiana *74A-2*
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Fowler, J. Herbert, Box 80—06MS—Mail Room 1, Redstone Arsenal, Alabama *69A-2*
Fowler, Robert D., 1244 Lions Avenue, Morgantown, West Virginia *0A-1*
Fowler, Thomas F., Plough, Incorporated, 3022 Jackson Avenue, Memphis, Tennessee *28A-2*
Fox, Donald P., 37 Hancock Street, Rochester 11, New York *44A-2*
Fox, Harry D., 101 Fremont Street, Shreveport, Louisiana *0AF-3*
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Fox, Joseph M., Merck, Sharp, and Dohme, Division of Merck and Company, Incorporated, West Point, Pennsylvania *31M-4*
Fox, L. O., Jr., 1848 Louder Heights Road, Charleston, West Virginia *58M-4*
Fox, Neil A., 831 Linden Avenue, Elizabeth, New Jersey *61A-2*
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Frederick, Robert G., 110 Pittsburgh Street, Zelienople, Pennsylvania *0M-3*
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Freed, Dean W., Thompson Ramo Wooldridge Incorporated, P.O. Box 8405, Littleton, Colorado *32M-3*
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Freeman, Emery E., Portsmouth Navy Yard, Code 309, Portsmouth, New Hampshire *62M-4*
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Freeman, Harris, 1722 Kendrick Street, Philadelphia 15, Pennsylvania *31A-2*
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Friedman, Nat H., c/o Duti-Duds, Incorporated, Lynchburg, Virginia *101M-4*
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Frost, Warren F., Heatherside Lane, Ipswick, Massachusetts *30A-2*
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Fuller, Ernest M., 5007 East Third, Tulsa 12, Oklahoma *15M-3*
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Fuller, William N., 3052A Western Avenue, Park Forest, Illinois *25A-1*

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Fuquay, Willard S., 100 North Frederick, Evansville, Indiana *88A-2*
Furry, E. G., 400 Meadowharen, Wichita 13, Kansas *56M-4*
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Gabrosek, Joseph, Jr., 1500 Forrest Drive, Barberton, Ohio *52M-4*
Gabruk, Walter H., 130 North Park Drive, Rochester 12, New York *44A-2*
Gaenssien, Philip, Thompson Products, Incorporated, 23555 Euclid Avenue, Cleveland 17, Ohio *7M-4*
Gaetano, Edward J., 1703 Elizabeth Street, Scranton 4, Pennsylvania *0A-1*
Gaffney, Bernard J., Mavrakos Candy Company, 4711 Delmar Boulevard, St. Louis 8, Missouri *16A-2*
Gaffney, John J., 217 Tanglewood Road, Trumbull, Connecticut *5M-4*
Gage, James, American Embassy, USOM, APO 94, San Francisco, California *0M-3*
Gaghen, John E., R.F.D. #1, Godfrey, Illinois *16A-2*
Gahl, Fred A., 655 Brierhill Road, Deerfield, Illinois *25M-4*
Gaines, Craig T., 4814 George Street, Wichita Falls, Texas *0A-1*
Galbraith, Frank D., 197 West Fourth Avenue, Columbus, Ohio *1A-2*
Galbraith, Oliver, III, 8145 Whitehead Place, La Mesa, California *29A-1*
Gale, Gaylord Glynn, P.O. Box 2, Ocala, Florida *27M-4*
Gale, James O. B., 6840 Walnut Street, Neville Island, Pittsburgh 25, Pennsylvania *3AF-3*
Gale, William R., 443 Ross Road, Columbus 13, Ohio *1A-2*
Gall, John L., 2529 Eleventh Street, Cuyahoga Falls, Ohio *52A-2*
Gall, Richard O., 622 Seminole Road, Chillicothe, Ohio *0A-1*
Gallagher, Henry A., Goodyear Tire and Rubber Company, 1144 East Market Street, Akron 16, Ohio *52M-4*
Gallagher, James G., 1 Dartmouth Drive, Auburn, Massachusetts *68M-3*
Gallagher, Ronald M., 7253 South Paulina, Chicago, Illinois *25A-1*
Galloway, Bruce V., R.R. 2, Plant City, Florida *91M-4*
Galloway, Russell M., 900 Thorn Run Road, Coraopolis, Pennsylvania *3A-1*
Gally, David L., c/o Murray Sales Company, #16 Wazee Market, Denver 2, Colorado *32A-1*
Gambill, R. K., USS PICKING (DD-685), c/o Fleet Post Office, San Francisco, California *6A-2*
Gambrell, C. B., Department of Industrial Engineering, School of Engineering, Arizona State University, Tempe, Arizona *70M-4*
Gammon, George W., III, 2905 South Twenty-ninth, St. Joseph, Missouri *92A-2*
Gammons, Vance S., Box 35, Cowan, Tennessee *64A-1*
Ganley, Frederick William, Jr., 9905 River Road, Newport News, Virginia *99A-2*
Ganley, Robert D., 105 Santa Rita Street, Hurley, New Mexico *59A-1*
Ganzi, Richard L., 33 Overlook Road, Ardsley, New York *5A-4*
Gapp, William, 6120 North Keating, Chicago 46, Illinois *25A-1*
Garard, James A., 221 Woodland, Willard, Ohio *0A-1*
Garard, James H., Jr., 2822 Mount Holyoke, Columbus 21, Ohio *1M-4*
Garcia, Octavio, Apartado Aereo #4813, Cali, Colombia, South America *0A-1*
Gardner, Robert W., 3143 Redding Road, Columbus 21, Ohio *1A-2*
Gardner, Val J., 309 National Road West, Richmond, Indiana *2AF-4*
Garg, Anand, 5258 Eleventh Avenue, N.E., Seattle 5, Washington *20A-2*
Garland, John A., Jr., 41 Gleason Street, Watertown, Massachusetts *30A-2*
Garner, Richard E., 138 Carmelita Lane, San Bernardino, California *78A-2*
Garretson, Edwin H., 50 Audubon, Rochester 10, New York *44M-4*
Garretson, Henry C., Jr., 111 Wally Road, North Syracuse 12, New York *13M-4*
Garrett, Marvin S., 3113 Osprey, Louisville 13, Kentucky *18M-3*
Garrick, Kevin J., 2111 Wentworth Drive, Camp Hill, Pennsylvania *95A-2*
Garst, Daniel M., 2707 Mesa Linda Drive, N.E., Albuquerque, New Mexico *59M-3*
Garthoff, S. D., 407 Madison Avenue, Akron 20, Ohio *52A-2*
Garthwaite, David S., 505 Eighth Street, New Cumberland, Pennsylvania *72M-4*
Gartner, Ralph Louis, General Electric Company, Aircraft Nuclear Properties, Cincinnati 15, Ohio *8M-4*
Gary, Joseph W., Plant Superintendent, Continental Can Company, Incorporated, Robert Gair Paper Products Group, P.O. Box 1356, Tyler, Texas *60M-4*
Garza, Juan, 848 West Sharon Road, Redlands, California *78A-2*
Gasser, Sidney B., 1609 Lafayette, N.E., Albuquerque, New Mexico *59A-1*
Gast, Alan M., 1720 Cedar Avenue, Cincinnati 24, Ohio *8A-2*
Gates, Raymond J., 6 Hillview Avenue, Roslindale, Massachusetts *30M-4*
Gauthier, Gerard A., 23627 Hudson, Dearborn, Michigan *47M-4*
Gavett, Joseph W., School of Mechanical Engineering, Cornell University, Ithaca, New York *48A-1*
Gavin, Edward K., Anheuser-Busch, Incorporated, 3000 Temple Terrace Highway, Tampa 4, Florida *91A-4*
Gay, Herbert E., 1911 South Parkway East, Apartment #5, Memphis 14, Tennessee *28A-2*
Gear, Robert D., 16372 South East Taylor, Portland, Oregon *67A-1*
Gebhardt, George W., 650 Carleton Avenue, Anaheim, California *23A-1*
Gebhardt, Neil H., 524 Westview Street, Philadelphia 19, Pennsylvania *31A-2*
Gebo, Dale B., 275 North 725 West, Orem, Utah *50A-2*
Gechman, Marvin C., 3405 Toledo Terrace, B-1, Hyattsville, Maryland *14A-2*
Geeson, Don L., Plant Industrial Engineer, Reynolds Metals Company, Alloys Plant, Sheffield, Alabama *0M-3*
Geier, August F., 10404 Mill Road, Mt. Healthy, Ohio *8A-2*
Geier, John J., 294 Hartsdale Road, Rochester 22, New York *44M-4*
Geiger, Edwin R., 1000 Portola Drive, Arcadia, California *23A-1*
Geiger, Graham R., 519 Second Street, N.W., Waverly, Iowa *0A-1*
Geisel, Charles E., 8100 Rockwood Drive, St. Louis 23, Missouri *16M-4*
Geist, Lawrence, 1217 West Thirty-seventh, Erie, Pennsylvania *51AF-4*
Geistert, Robert J., 1514 Giddings Street, Grand Rapids 7, Michigan *0M-3*

Geller, Gerald, 2979 Crestline Drive, Macon, Georgia *55M-3*
Geller, Harry, 217 Mount Eden Parkway, Bronx 57, New York *5A-2*
Gellmann, Josef, 4508 Oxbow Drive, Sacramento 25, California *43A-2*
Gelster, Elwood K., 4475 East Harvard Avenue, Denver 22, Colorado *32M-3*
Geltz, Charles G., 1521 North West Seventh Avenue, Gainesville, Florida *27A-2*
Genzlinger, Bryce S., Assistant Professor of Industrial Engineering, Syracuse University, 146 Hinds Hall, Syracuse, New York *13M-4*
George, Arthur K., 5 Woodburn Way, Danville, California *12M-4*
George, Charles R., Jr., 1739 Harold Street, Dayton 6, Ohio *2A-2*
George, Glen M., 365 Afton Avenue, Youngstown 12, Ohio *24M-3*
George, Harold W., 380 North Mountain Avenue, Upper Montclair, New Jersey *61M-4*
George, Robert J., 302 South Peach, Tyler, Texas *60A-2*
George, Robert W., 3910 Barbara Ann Drive, Monroeville, Pennsylvania *3A-1*
George, Ross B., 9162 Clearwater, Dallas 31, Texas *10A-1*
George, Russell W., 112 Jefferson Park Drive, Huntington 1, West Virginia *58A-2*
George, Samuel J., 1346 Stuart Boulevard, N.E., Massillon, Ohio *19AF-3*
Georgopulo, George B., 6810 Fifteenth Avenue, N.E., Seattle 15, Washington *20A-2*
Gerbig, George Van, 903 Dickinson Street, Memphis 7, Tennessee *28M-4*
Gerdes, James R., 1644 West Addison Street, Chicago 13, Illinois *25A-3*
Gerdes, Keith W., 62 Pierremount Avenue, New Britain, Connecticut *75A-2*
Gerken, Gerald G., 178 Jennie Drive, Pleasant Hill, California *12AF-3*
Gerloff, Don G., 1315 West Avenue I, Temple, Texas *0A-1*
Gerner, Edward, Jr., 132 Arla Drive, Pittsburgh 20, Pennsylvania *3M-3*
Gerrard, Clarence C., 12706 East Blossey, Spokane 65, Washington *0A-1*
Gerwe, James A., 15767 One Hundred Seventeenth Avenue, S.E., Renton, Washington *20A-2*
Gery, Ralph C., Eli Lilly and Company, Indianapolis 6, Indiana *65M-4*
Gessaman, Cooper H., Standard Register Company, 626 Albany Street, Dayton 1, Ohio *2A-2*
Getz, Frank R., 20 Gilmore Boulevard, N., Wappingers Falls, New York *76A-4*
Getz, Ralph E., 621 South Cooper, Lockland, Cincinnati 15, Ohio *8A-2*
Getzler, Philip, 151 Norfolk Street, New York 2, New York *5A-2*
Gewurtz, Gustav, Penn Ventilator Company, Goodman and Allegheny Avenue, Philadelphia 40, Pennsylvania *31A-2*
Geyer, Elwood W., 905 North Geneva Street, Glendale 7, California *23M-4*
Geyer, Frank T., 187 Garden Road, Columbus 14, Ohio *1M-4*
Ghormley, Glen E., 605 C Prospect Avenue, South Pasadena, California *23A-1*
Giacomo, Donald G., 1145 Cedar Avenue, Provo, Utah *50A-2*
Giambalvo, Edward, 312 Division Street, Schenectady 4, New York *0A-3*
Gianatassio, Michael, 46 Chatham Road, Everett 49, Massachusetts *30A-2*
Gianino, Salvatore, 18 Ferncliff Avenue, Saugus, Massachusetts *30AF-4*
Giardina, Vincent J., 8652 Williams Avenue, Philadelphia 50, Pennsylvania *31A-2*
Gibbs, George W., 1219 Meadowview Drive, Miamisburg, Ohio *2M-4*
Gibbs, Herschel W., Jr., 3201 West Division, Arlington, Texas *10A-1*
Gibbs, Lloyd M., Continental Can Company, 349 Oraton Street, P.O. Box 1159, Newark 4, New Jersey *61M-4*
Gibbs, Paul W., 7345 Cherokee Drive, Prairie Village 15, Kansas *92M-4*
Gibian, E. F., 16264 Oakhill Road, Cleveland 12, Ohio *7M-4*
Gibson, Charles A., 926 Watauga Street, Kingsport, Tennessee *17A-1*
Gibson, Gordon S., 1320 Nickolson Street, Hyattsville, Maryland *14A-2*
Gibson, James F., 428 Spring Valley Road, Richardson, Texas *10M-3*
Gibson, M. Arnold, 9159½ Forty-fifth, S.W., Seattle 16, Washington *20A-2*
Gibson, William, Director Industrial Engineering, Cerro De Pasco Corporation, La Oroya, Peru, South America *0A-1*
Giedlin, Robert W., 5722 Greene Street, Philadelphia 44, Pennsylvania *31A-2*
Gifford, Daniel A., 2625 Pine Street, Waukegan, Illinois *25A-3*
Giffune, Joseph M., General Electric Company, French Road, Utica, New York *85A-2*
Gilbert, Donald E., 24410 Garden Drive, Euclid 23, Ohio *7A-2*
Gilbert, Lloyd E., Virtue Brothers Manufacturing Company, 5701 West Century Boulevard, Los Angeles 45, California *23A-1*
Gilbert, Michael N., 23 Buckingham Road, West Orange, New Jersey *5M-4*
Gilbert, Michael S., Grandview Avenue, Monsey, New York *0A-1*
Gilbert, Robert P., 709 Grove Street, Birmingham 9, Alabama *9A-4*
Gilbertson, Donald G., 3225½ East Colorado Street, Pasadena 8, California *23AF-3*
Gilbreath, Joseph E., Jr., 613 East Jackson Boulevard, Savannah, Georgia *26A-1*
Gilbreth, Lillian, 433 West Twenty-first Street, New York 11, New York *5F-0*
Giles, Arthur P., P.O. Box #25, Pine Lake, Georgia *6A-2*
Gilfeather, Frank A., R.R. 8, Box 665, Ft. Worth 8, Texas *10M-3*
Gill, James B., 1516 Elmrow Drive, Ft. Wayne, Indiana *34A-1*
Gill, James F., 5016 Taunton Way, Columbus 4, Ohio *1A-2*
Gill, John K., 116 Kenwood Place, Lynchburg, Virginia *101A-4*
Gill, Robert F., 754 Scotland Road, Apartment A5, Orange, New Jersey *61A-2*
Gillaspy, Douglas K., 13112 Rose Avenue, Los Angeles 66, California *23A-1*
Gillespie, John A., 813 Rosetree Lane, Seaford, Delaware *0A-1*
Gillespie, Joseph Woodrow, 1075 James Street, Springfield, Ohio *2M-4*
Gillespie, William, Apartment 1B, 107 Roney Lane, Syracuse 5, New York *13AF-4*
Gillett, Clifford C., 1412 North Broadway, Peoria, Illinois *80A-2*
Gillett, Robert S., 5309 North Thirty-fourth Street, Phoenix, Arizona *70A-2*
Gillette, Leroy O., 1829 Rockford Lane, Lancaster, Pennsylvania *71M-4*
Gilliam, W. R., 1323 Richmond Place, Charlotte 9, North Carolina *83A-2*
Gilliland, Roy A., 140 Markham Drive, Pittsburgh 28, Pennsylvania *3M-3*
Gilmore, Charles N., Jones and Laughlin Steel Corporation, New York Ore Division, Star Lake, New York *0A-1*
Gimple, Warren E., 2511 Barclay Drive, Nashville 6, Tennessee *73M-3*
Ginn, Harry W., 961 Rose Court, Santa Clara, California *37M-4*
Ginsberg, Kalman, 67 West Tremont Avenue, Bronx 53, New York *5A-2*
Giovanini, Frank, 4737 Laura Drive, Concord, California *12M-4*
Giovanoni, Richard L., 104 Cook Street, Bath, New York *48M-3*
Giovenazzo, Sam G., 3649 Fifteenth Avenue Court, Moline, Illinois *46A-2*
Girouard, William F., 2097 Bluffhill, Monterey Park, California *23A-1*
Girshick, Irving B., 150 Houston Terrace, Stamford, Connecticut *82M-4*
Gish, Thurman M., Chief Engineer, Hallmark Cards, Incorporated, 2500 McGee Trafficway, Kansas City, Missouri *92M-4*
Gittler, Harvey, 36 West Maxwell Drive, West Hartford 7, Connecticut *75A-4*
Givan, John H., 2 Humbolt Avenue, Worcester, Massachusetts *68A-2*

Given, John R., Standard Brands, Incorporated, 625 Madison Avenue, New York 22, New York *5M-4*
Gladu, Robert L., 332 Orange Street, Manchester, New Hampshire *62A-2*
Glaser, Frank, Collins Radio Company, 166 West Olive Avenue, Burbank, California *23A-1*
Glaser, Joseph Robert, 911 Miriam Drive, W., Columbus 4, Ohio *1M-4*
Glass, Robert S., 1833 Rosemont Drive, Fort Wayne 7, Indiana *34A-3*
Glassey, Charles R., 108 Pontiac Drive, Rochester 17, New York *44A-2*
Glaze, Donald Ralph, 362 Kreag Road, Pittsford, New York *44M-4*
Glen, Thaddeus Mathew, Seabrook Farms, RD 5, Bridgeton, New Jersey *0M-3*
Glenn, John K., 1413 East Brainard, Pensacola, Florida *33A-1*
Glenn, Robert D., Jr., Route #1, c/o Robert D. Glenn, Sr., Aberdeen, Mississippi *0A-1*
Glickman, Carl, 1715 Bruckner Boulevard, Bronx 72, New York *5A-2*
Glickstein, Aaron, Department of Agricultural Economy, Purdue University, West Lafayette, Indiana *35A-2*
Glinski, Richard E., 78 Geneva Street, St. Catharines, Ontario, Canada *87A-1*
Gloeb, William T., R.R. #5, Avery Crossing, Omaha 7, Nebraska *90A-2*
Gnadinger, Norbert E., Tube Turns, Division of Chemetron Corporation, P.O. Box 987, Louisville 1, Kentucky *18A-1*
Goasdoue, Marcel, 1791 First Avenue, New York 23, New York *5A-2*
Goates, Dean G., 5543 Berry Creek, Houston 17, Texas *22A-1*
Gobat, Fred R., R.F.D. #11, Lafayette, Indiana *35A-2*
Gober, Alfred L., 8 Phyllis, Pine Bluff, Arkansas *84A-1*
Godbout, Leo J., The Pillsbury Company, 210 South Garey Street, Los Angeles 12, California *23A-1*
Goddard, James M., Headquarters Squadron 2713, Supply Garrison, Box 1374 APO 323, San Francisco, California *0AF-3*
Goddard, William A., The Pillsbury Company, 210 South Garey Street, Los Angeles 12, California *23A-1*
Godfrey, Albert S., 3112 Cheyenne, Pueblo, Colorado *32M-3*
Godfrey, D. E., 3239 Clairemont Drive, Apartment 4, San Diego 17, California *29A-1*
Godley, James E., Jr., 1210 East Forty-ninth Street, Savannah, Georgia *26A-1*
Godley, Robert B., Box 256, Wrightsville Beach, North Carolina *0A-1*
Goelz, Paul C., Chemical Department of Marketing Management, St. Mary's University, Woodlawn Campus, San Antonio 1, Texas *39AF-4*
Goelz, Robert C., Worden and Risberg, 235 Montgomery Street, Room 1120, San Francisco 4, California *12AF-3*
Goembel, Marvin H., 2472 Sanford Avenue, Sanford, Florida *27A-2*
Goetsch, Clarence H., 5309a Virginia, St. Louis 11, Missouri *16A-2*
Goetschius, Gary G., Alder, Montana *0A-1*
Goetting, Clifford S., 10602 South Grovedale Drive, Whittier, California *23A-1*
Goff, James D., 626 North Rosemont, Dallas 8, Texas *10A-1*
Goins, Robert J., 4418 South East Anthony Wayne Drive, Ft. Wayne, Indiana *34A-1*
Golay, Faber, 10623 Deerfield Road, Cincinnati 42, Ohio *8A-4*
Gold, Solomon W., 2309 East Twenty-fourth Street, Brooklyn 29, New York *5M-4*
Golda, John J., 24 Ahsley Street, New Bedford, Massachusetts *30A-2*
Goldberg, Max, Simmons Street, Saugerties, New York *76A-4*
Goldenberg, Arthur P., 1383 Panther Road, Rydal, Pennsylvania *31A-4*
Goldenberg, Fred, 255-27 Seventy-fourth Avenue, Glen Oaks, Queens, New York *5A-2*
Goldenkoff, Ralph J., 67-38 One Hundred Eighth Street, Forest Hills 75, New York *5M-4*
Goldman, Ernest N., Peach Orchard, Arkansas *84A-1*
Goldman, Herbert, 370 Holland Lane, Englewood, New Jersey *61A-2*
Goldman, Jay, Washington University, Lindell and Skinker, St. Louis 5, Missouri *16M-4*
Goldman, Jerome, 1805 East Indian Creek Drive, Mobile, Alabama *79M-4*
Goldman, Jerome M., 240 Cleveland, Gary, Indiana *53A-1*
Goldman, Louis E., Jr., 841 North Wild Olive Avenue, Daytona Beach, Florida *27A-2*
Goldsby, Arthur F., 3120 Gulfstrehm, Isle of Catalina, Orlando, Florida *27A-2*
Goldsmith, Bernard P., 12 Holly Road, Walpole, Massachusetts *30AF-4*
Goldstein, Roy M., 975 Walton Avenue, New York 52, New York *5A-2*
Goldstein, Samuel, 5319 Kalein Drive, Culver City, California *23A-3*
Goldsworthy, Bertis A., 746 East 560 North, Provo, Utah *50M-4*
Golf, George P., 1341 Second Avenue, Salt Lake City 3, Utah *50M-4*
Golland, Marvin L., 83-05 Ninety-eighth Street, Woodhaven 21, New York *86A-2*
Gollender, Morton, 712 Catherine, Ann Arbor, Michigan *0M-3*
Gollong, Paul B. W., 1018 North State Street, Chicago 10, Illinois *25M-4*
Golub, David H., 7851 Wayne, University City 14, Missouri *16A-2*
Golubin, Nicholas M., 2809 Rosswood Drive, Mobile, Alabama *79A-2*
Gomberg, William, Department of Industry, Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania *31M-4*
Gomena, John E., Birds Eye Division, General Foods Corporation, 40 Franklin Street, Rochester 4, New York *44M-4*
Gomes, Norman V., 2912 Owenwood Drive, Ft. Worth 9, Texas *10M-3*
Gongwer, Ralph A., Deere and Company, Industrial Engineering Department, Moline, Illinois *46A-2*
Gonzales, James R., 503 East Hillsboro Avenue, Tampa, Florida *91A-2*
Gooby, Matthew L., 92 Bush Court, Stratford, Connecticut *82A-2*
Gooch, John H., 803 Southeast First Street, Evansville 13, Indiana *88M-4*
Gooch, William T., 2217 Longstreet Drive, Memphis 14, Tennessee *28A-2*
Good, Ralph L., 2443 South Hudson Avenue, Tulsa, Oklahoma *15M-3*
Goode, Henry P., Department of Industrial and Engineering Administration, Cornell University, Ithaca, New York *48M-3*
Goodemote, Harold Lee, 326 North Mount Joy Street, Elizabethtown, Pennsylvania *71A-2*
Goodfriend, Nathan, 3717 Coolidge Avenue, Los Angeles 66, California *23M-4*
Goodman, Charles K., 371 Poppy Street, Long Beach 5, California *23A-1*
Goodman, Frederick I., 417 Sterling Street, Brooklyn 25, New York *5A-2*
Goodman, Marvin K., Route 10, Kingsport, Tennessee *17A-1*
Goodman, Paul W., 1905 Forty-eighth, N.W., Canton 9, Ohio *19M-3*
Goodman, Roger M., 33B Lowry Court, Clifton, New Jersey *5A-2*
Goodson, James M., Jr., 1609 Belvedere Drive, Birmingham 9, Alabama *9A-4*
Goodwin, George R., 3917 East Skinner, Wichita 17, Kansas *56AF-4*
Goodwin, Harold C., 144 Hale Street, Beverly, Massachusetts *30A-2*
Goodwin, Herbert F., Room 52-025, Massachusetts Institute of Technology, Cambridge 39, Massachusetts *30M-4*
Goodwin, Loyd R., Box 133, Earth, Texas *0A-1*
Goodwin, Robert H., Faultless Caster Corporation, 1521 North Garvin Street, Evansville, Indiana *88A-2*
Goolsby, William W., 925 Rosedale Street, Kingston, Tennessee *11A-2*

Gordon, Billie, Kaiser Aluminum and Chemical Corporation, Box 1031, Baton Rouge 1, Louisiana *41A-1*

Gordon, George, Vice President, M. Gordon Construction Company, 1436 East Elizabeth Avenue, Linden, New Jersey *61M-4*

Gordon, Simeon E., 97-12 One Hundred Third Avenue, Ozone Park 17, New York *5A-2*

Gorenberg, Frank D., 318 Lepes Road, Somerset, Massachusetts *30A-2*

Gorline, Gerald A., 1225 St. Joan Drive, Florissant, Missouri *16A-2*

Gorman, John J., 5706 North Rowland Avenue, Temple City, California *23AF-3*

Gorman, Robert J., 241 Berkshire Drive, Youngstown 12, Ohio *24M-3*

Gorman, Thomas F., International Business Machines, Neighborhood Road, Kingston, New York *76A-2*

Gormeley, James Francis, 31 Dogwood Lane, Needham, Massachusetts *30M-4*

Gosieski, George J., 3420 Park Boulevard, San Diego 3, California *29A-1*

Gotcher, James W., Jr., c/o Gotcher Manufacturing Company, Box 721, Clarksdale, Mississippi *0A-1*

Gotcher, Nolan H., 2507 Easy Lane, Pasadena, Texas *22A-1*

Gotschall, Robert E., 3932 South Barr Street, Fort Wayne 5, Indiana *34A-1*

Gotterer, Malcolm H., Box 191, Berkeley 1, California *12A-4*

Gottschalk, Robert G., 115 Peachtree Road, Penfield, New York *44A-2*

Gough, Francis J., 3534 Wright Avenue, St. Ann, Missouri *16AF-4*

Gouhin, James E., Murray Avenue, Ashtabula, Ohio *0A-1*

Gould, Arthur F., 821 Magnolia Road, Hellertown, Pennsylvania *77M-4*

Gould, Charles T., Albert E. Reed and Company, Limited, Larkfield, Kent, England *0M-3*

Gould, Joseph, 98 Hornby Drive, Painted Post, New York *48A-1*

Gould, Marvin L., 25924 Seventy-eighth South, Kent, Washington *20A-2*

Gould, Philetus S., Manager Administrative Engineering, Goodyear Tire and Rubber Company, Akron 16, Ohio *7M-4*

Gouldsberry, Harold B., 3906 Twenty-first Street, N.W., Canton 8, Ohio *19A-1*

Gowdy, Ivan M., 510 Ivy Street, Elmira, New York *48M-3*

Gower, John Woodrow, 28 North Wilkinson Street, Dayton 2, Ohio *2M-4*

Goyne, Walter V., 5415 Cathedral Avenue, N.W., Washington 16, District of Columbia *14M-4*

Grabowski, George A., 1002 Sawyer Road, Toledo 7, Ohio *36A-2*

Grabowski, John S., 5614 North Mason Avenue, Chicago 46, Illinois *25A-1*

Grabstein, Norman E., 240 Gellert Drive, San Francisco 27, California *12M-4*

Graddy, Wendell B., 932 McKellar Drive, Tullahoma, Tennessee *64A-1*

Grado, John, Jr., Fitchburg Paper Company, Decotone Division, Fitchburg, Massachusetts *68M-3*

Grady, R. Paul, 364 East Weber Road, Columbus 2, Ohio *1M-4*

Grady, Warren G., Jr., Link Aviation, Incorporated, Hillcrest, Binghamton, New York *96A-1*

Graeber, Dan F., 612 Elmwood Street, Anaheim, California *78AF-4*

Graff, Richard A., Armstrong Cork Company, Floor Plant, Lancaster, Pennsylvania *71M-4*

Graff, Sol, 1692 Chapin Avenue, North Merrick, New York *86A-2*

Graff, Vernon F., 3416 Twenty-sixth, N.W., Canton 8, Ohio *19M-3*

Graham, Arthur S., Jr., 15 Plymouth Drive, Scarsdale, New York *5M-4*

Graham, Ben S., R.R. 2, Tipp City, Ohio *2M-4*

Graham, Dean H., Lawrence, M.R. 2, Ambler, Pennsylvania *31A-2*

Graham, William D., American Steel and Wire Division, United States Steel Corporation, 1403 Rockefeller Building, Cleveland 13, Ohio *7M-4*

Graham, William E., 3177 Emerson Street, Palo Alto, California *37A-1*

Grams, Stanley, 1927 Manhattan Avenue, Apartment 1, East Palo Alto, California *37A-1*

Grandi, Mario M., 719 North Hawthorne Street, Anaheim, California *23M-4*

Grandjean, Ronald F., 3805 Fifty-fourth Street, N.W., Canton 9, Ohio *19AF-3*

Grandle, Ralph W., 9756 South Leavitt Street, Chicago 43, Illinois *25A-1*

Granger, Harvey, Jr., P.O. Box 1159, Savannah, Georgia *26A-3*

Grant, Donald S., General Works Manager, Canada Wire and Cable Company, Limited, Postal Station R, Toronto 17, Ontario, Canada *87A-1*

Grant, Earl C., 1819 South Pratt, Apartment D, Dallas 24, Texas *10A-1*

Grant, Homer H., Jr., Head, Department of Engineering, University of Southern California, Los Angeles 7, California *23M-4*

Grant, Samuel N., 411 South Kerth Avenue, Evansville 14, Indiana *88M-4*

Grant, William B., 1741 Langston Avenue, S.W., Atlanta, Georgia *6A-2*

Grant, William J., 14560 Hubbell, Detroit 27, Michigan *47A-2*

Grashel, Harry, Jr., 236 Crandall Drive, Worthington, Ohio *1M-4*

Grasman, Thomas E., 4632 West Tripoli Avenue, Milwaukee 19, Wisconsin *45A-2*

Gratz, Jack, Jr., 3108 Merritt Parkway, Sinking Springs, Pennsylvania *71A-4*

Graul, Don W., Box 403, Bishop, Texas *0A-1*

Graves, Albert H., 724 Tuttle, Manhattan, Kansas *56A-2*

Graves, Bryan E., 1048 Lakeview Avenue, Jamestown, New York *0A-1*

Graves, Charles M., 528 Pepper Ridge Road, Stamford, Connecticut *5A-2*

Graves, Fred R., White's Creek, Tennessee *73M-3*

Graves, Richard L., 13744 Twelfth Avenue, S.W., Seattle 66, Washington *20A-2*

Gravis, Christo P., 1276 Crestwood Circle, Bountiful, Utah *50A-2*

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Gray, Henry T., 428 Haverford Road, Wynnewood, Pennsylvania *31M-4*

Gray, Raymond E., 1301 Beech Street, Valparaiso, Indiana *53A-1*

Gray, Waldo H., Wyandotte Chemical Corporation, Wyandotte, Michigan *47M-4*

Graybeal, Bernard B., Jr., 1224 Bolton Street, Winston-Salem, North Carolina *21A-2*

Grayson, Walter, 8138 Sepulveda Place, Van Nuys, California *23A-3*

Grayuski, Frank D., 1547 Salerno Drive, St. Louis 21, Missouri *16AF-4*

Graziani, Frank, 7621 Scenic Court, Fair Oaks, California *43A-2*

Greanoff, Charles S., 15011 Hilliard Road, Lakewood 7, Ohio *7M-4*

Greaves, Robert G., 616 Oakton Street, Evanston, Illinois *25M-4*

Grebeldinger, Nicholas F., The British American Oil Company, Limited, 800 Bay, Toronto, Ontario, Canada *87AF-3*

Green, Abner B., 570 Seventh Avenue, New York 18, New York *5M-4*

Green, Bobby E., 233 Southwest 146, Seattle 66, Washington *20A-2*

Green, Charles R., Jr., 212 Oak Drive, Lake Jackson, Texas *22M-4*

Green, Clarence, 218 Sunset Lane, Munster, Indiana *53A-1*

Green, Clois L., 106 Viennese Drive, Pittsburgh 9, Pennsylvania *3A-1*

Green, Donald R., 820 North Eppington Drive, Trotwood, Ohio *2A-2*

Green, Eugene W., Sears, Roebuck and Company, 675 Ponce De Leon Avenue, N.E., Atlanta 6, Georgia *6A-2*

Green, Francis E., Jr., Eureka Specialty Printing Company, 530 Electric Street, Scranton 9, Pennsylvania *0M-3*

Green, Fred W., 1800 Bates Avenue, Springfield, Illinois *80A-2*

Green, Herbert E., 2533 Seventy-second Avenue, S.E., Mercer Island, Washington *20M-4*

Green, I. Jay, 217 Laurel Street, Greenville, Ohio *2M-4*

Green, John P., Ch. Prod. Eng. Garrett Oil Tools Company, Industrial Boulevard, Longview, Texas *60A-2*

Green, K. Michael, 4607 Sixty-sixth Avenue, N., Minneapolis 22, Minnesota *38A-2*
Green, Lloyd M., Summer Street, R.F.D. #2, Norwell, Massachusetts *30A-2*
Green, Robert W., Std. Railway Equipment Division, 4527 Columbia Avenue, Hammond, Indiana *53A-1*
Green, Stanley, 2813 Kenwood Street, Salt Lake City 6, Utah *50A-2*
Green, William F., 1501 Commerce, Little Rock, Arkansas *84A-1*
Greenberg, Irwin, 27 Dale Street, West Peabody, Massachusetts *30A-2*
Greenberg, Murray, 185 East Third Street, New York 9, New York *5M-4*
Greene, Alan Kenneth, Box 537, Mount Vernon, Illinois *0A-1*
Greene, Charles H., R.R. #1, Box 159, Wise, Virginia *0A-1*
Greene, Harry D., Jr., Hinde and Dauch, Executive Offices, Sandusky, Ohio *36A-2*
Greene, H. Theodore, 3632 Sheridge Drive, Sherman Oaks, California *23M-4*
Greene, James H., Department of General Engineering, Purdue University, Lafayette, Indiana *35M-4*
Greene, Louis, 700 Santandar Avenue, Coral Gables, Florida *40M-3*
Greene, Robert J., 9016 West Swan Circle, Brentwood 17, Missouri *16A-2*
Greene, Warren K., 2684 Southwest Talbot Road, Portland 1, Oregon *67A-1*
Greenglass, Bert, 2913 Bayless Drive, Hunstville, Alabama *69A-2*
Greenhut, Arnold, 149-05 Seventy-ninth Avenue, Flushing 67, New York *5A-2*
Greenleaf, Kenneth E., Jr., 4127 Hess, Saginaw, Michigan *98A-2*
Greenstein, Howard N., 3495 Fenton Avenue, Bronx 69, New York *5A-2*
Greenwall, Elton G., 3040 South Bellaire, Denver, Colorado *32A-1*
Greenwood, Frances C., 4006 Brighton Avenue, Oakland 2, California *12M-4*
Greenwood, Orrin J., R.F.D., #2, Tullahoma, Tennessee *64M-3*
Greenwood, Zantine, 7559 Olive Street, Kansas City, Missouri *92AF-4*
Greer, Howard S., 40 A Aldrich Drive, Fords, New Jersey *5A-2*
Greer, Thornton C., 5308 Shady River Road, Houston 27, Texas *22M-4*
Gregg, Anton T., Caterpillar Tractor Company, East Peoria, Illinois *80M-4*
Gregoire, Louis B., 132 Atlantic Avenue, Eau Gallie, Florida *0A-1*
Gregor, John H., 3138 Elmont Drive, Toledo 6, Ohio *36A-2*
Gregory, Edwin B., Chief Industrial Engineer, American Biltrite Rubber Company, 22 Willow Street, Chelsea, Massachusetts *30M-4*
Gregory, Joseph F., 3938 Forest Highlands Drive, Chattanooga 5, Tennessee *54A-2*
Gregory, William A., 223 West Thirty-first Street, Huntington 4, West Virginia *58A-2*
Greig, Rowed A., c/o Orinoco Mining Company, Puerto Ordaz, Venezuela, South America *0M-3*
Greiner, Howard G., The Jeffery Manufacturing Company, First Avenue and Fourth Street, Columbus 16, Ohio *1A-2*
Greller, Nelson P., Nelson P. Greller and Associates, 2800 Allendale Place, N.W., Washington 8, District of Columbia *14M-4*
Grelson, Clarence O., 3623 Harriet Avenue, Minneapolis 9, Minnesota *38A-2*
Grendel, Edward J., 4507 Telhurst Road, South Euclid 21, Ohio *7M-4*
Greschel, Charles H., 207 Sunset Drive, Antioch, California *12A-2*
Gresla, John F., Roberts Toledo Rubber Company, 1200 Prospect, Toledo 13, Ohio *36M-4*
Gretton, Wallace T., 69 Phyllori Court, R.R. #1, Stoney Creek, Ontario, Canada *87M-3*
Grey, Richard G., 1046 Danbury Drive, San Jose 29, California *37AF-3*
Grice, Noel C., 2814 North Holyoke, Wichita 20, Kansas *56A-2*
Griebel, Richard H., Clarke Road, Barrington, Rhode Island *0M-3*
Griffen, Daniel L., Jr., Assistant Professor of Industrial Engineering, Iowa State University, Ames, Iowa *0M-3*
Griffin, Floyd F., 3407 Kensington, Tampa 9, Florida *91A-2*
Griffin, Harold W., Gilmanton, New Hampshire *63AF-3*
Griffin, Marvin A., 23 Ridgefield Road, Lutherville, Maryland *42M-4*
Griffin, Norman E., 9713 Singleton Drive, Bethesda 14, Maryland *14M-4*
Griffith, Albert E., 1221 Southwest One Hundred Thirty-ninth, Seattle 66, Washington *20A-2*
Griffith, Arthur R., 2626 Darby Drive, Wilmington 8, Delaware *100M-3*
Griffith, Howard P., 7300 Forty-ninth, N.E., Seattle 15, Washington *20A-2*
Griffith, James William, Southern Methodist University, S.M.U. Box 166, Dallas 5, Texas *10M-3*
Griffith, John E., Jones and Laughlin Steel Corporation, #3 Gateway Center, Pittsburgh 30, Pennsylvania *3M-3*
Griffith, Norris A., 4025 Northwest Fifteenth Street, Oklahoma City, Oklahoma *57M-4*
Griffiths, Robert L., 2511 Fourteenth Street, Cuyahoga Falls, Ohio *52A-2*
Grigalonas, Joseph J., Westclox, Division of General Time, La Salle, Illinois *80A-2*
Griggs, Albert L., 523 West County Road, Odessa, Texas *0A-1*
Grigsby, James O., 3951 Skyland Drive, Kingsport, Tennessee *17A-1*
Grimes, Clifford B., 1118 Ball Street, Perry, Georgia *55A-1*
Grimes, Frank P., 210 Demong Drive, Syracuse 3, New York *13M-4*
Grimes, James M., Bachmann-Uxbridge Worsted Company, Macon Textile Division, Macon, Georgia *55AF-3*
Grimes, L. Roger, 1762 North Roosevelt Avenue, Altadena, California *23M-4*
Grimes, William B., 1202 Ryland Avenue, Cincinnati 37, Ohio *8M-4*
Grinberg, Paul I., Jr., 130 East Fifty-ninth Street, New York 22, New York *5A-4*
Gring, Robert A., 313 Phelps Avenue, Bergenfield, New Jersey *5A-2*
Grinnell, Warren D., Adding Machine Division of N.C.R. Company, South Aurora Street, Ithaca, New York *48M-3*
Grist, John, Jr., 2428 Sixteenth Street, N.W., Washington, District of Columbia *14A-2*
Griswold, Kenneth C., Perk's Boulevard, R.F.D. #1, Cold Spring, New York *76A-2*
Grodemange, Herbert, Jr., 1176 Oregon, Green Bay, Wisconsin *45A-2*
Groebe, Gerald H., 10915 Artesian, Chicago 43, Illinois *25A-1*
Groeger, Klaus W., 6802 Halifax Street, San Diego 20, California *29A-1*
Groelinger, Herbert J., 15120 Mulholland Drive, Los Angeles 24, California *23A-3*
Groenke, James F., 508 West Seventh Street, North Canton, Ohio *19M-3*
Groff, Ronald I., 684 Linden, Pensacola, Florida *33A-1*
Groh, Harold C., 664 Van Voorhis Avenue, Rochester 17, New York *44A-2*
Groseclose, Frank F., 1429 Brookvally Lane, N.E., Atlanta 5, Georgia *6F-0*
Groseclose, Henry C., III, Poly Scientific Corporation, Blacksburg, Virginia *81M-3*
Gross, Edward W., Jr., 123 Central Avenue, Turtle Creek, Pennsylvania *3A-1*
Gross, Kenneth F., 747 Atlantic Avenue, York, Pennsylvania *72M-4*
Gross, Richard G., 18421 Kelly Road, Detroit 24, Michigan *47A-2*
Gross, Sidney, 1907 Seventy-fifth Street, Brooklyn 4, New York *5A-2*
Grossman, Robert B., 475 Rosdale Avenue, White Plains, New York *5A-2*
Groth, Q. N., Axle Division, Eaton Manufacturing Company, 739 East One Hundred Fortieth Street, Cleveland 10, Ohio *7M-4*
Grottle, George T., 1200 South Arlington Ridge Road, Arlington, Virginia *14M-4*
Grout, Gardner K., 2240 Chaucer Road, San Marino, California *23A-1*

Grout, Robert C., 83 Gorsline Street, Rochester 13, New York *44A-2*
Grove, James W., Armstrong Cork Company, Liberty Street, Lancaster, Pennsylvania *71M-4*
Groves, Robert L., 2547 East Sixty-eighth Street, Indianapolis, Indiana *65A-2*
Grozier, Robert C., Allentown R.D. 4, Allentown, Pennsylvania *77A-2*
Gruber, Foster M., 20611 Acre Street, Canoga Park, California *23M-4*
Gruber, William W., 1556 Westdale Road, Cleveland 21, Ohio *7A-2*
Grubiak, John F., 40 Dalton Road, Yonkers, New York *5A-2*
Grudzien, Walter J., 22 Laurel Street, Waterbury, Connecticut *97M-4*
Grunke, Glenn G., 104 Valley Road, Papillion, Nebraska *90A-2*
Grupenhof, Raymond W., Western Electric Company, Lexington Road, Winston-Salem, North Carolina *21M-4*
Gryna, Frank M., Jr., 1538 Putty Hill Avenue, Towson 4, Maryland *42M-4*
Guaclides, James K., 15 Marjorie Terrace, Englewood Cliffs, New Jersey *5A-2*
Guard, Raymond J., Aluminum Company of America, Alcoa, East State Street, Lafayette, Indiana *35A-4*
Guarino, R. C., 319 Frankel Boulevard, Merrick, Long Island, New York *86A-4*
Guenthner, John V., 4029 Lambert Avenue, Louisville 18, Kentucky *18A-3*
Guffin, William S., Jr., 30 Spence Avenue, N.E., Atlanta 17, Georgia *6A-2*
Guggolz, Allan D., 109-29 Ninety-sixth Street, Ozone Park 17, New York *5A-2*
Guilfoyle, Harold Bernard, 1474 Skyline Drive, Port Credit, Ontario, Canada *87M-3*
Guin, Maury D., 9002 Hackney Lane, Dallas 18, Texas *10A-1*
Guindon, George J., 284 Riverside Drive, Detroit 15, Michigan *47A-2*
Guinther, Karl C., 710 Cass, St. Clair, Michigan *47M-4*
Gulban, William D., 1108 Dale Drive, Silver Spring, Maryland *14A-2*
Gulick, Walter C., Cost. Eng., Ethyl Corporation, Box 341, Baton Rouge, Louisiana *41M-3*
Gummer, Robert Edward, Sealright-Oswego Falls Corporation, 314 South First Street, Fulton, New York *13M-4*
Gundersen, Jerrold P., Taft Road, R.D. #1, East Syracuse, New York *13A-2*
Gunderson, Robert B., 6514 Sheridan, Richfield 23, Minnesota *38M-4*
Gunderson, Roger L., 108 Berkshire Place, Lynchburg, Virginia *101AF-4*
Gunnis, William H., 406 Gordon Road, Whitpain Estates, Ambler, Pennsylvania *31M-4*
Gunter, Herman C., Fuquay Springs, North Carolina *66A-1*
Gunvalsen, Arthur W., 3411 West One Hundred Nineteenth Street, Cleveland 11, Ohio *7A-4*
Gurdon, Charles G., 1103 Henning Avenue, Evansville, Indiana *88M-4*
Gurniak, Theodore B., 224 Fisher Road, Jenkintown, Pennsylvania *31A-4*
Gush, John Burrows, Apartment 206, 606 Avenue Road, Toronto 7, Ontario, Canada *87M-3*
Gustad, Louis, Jr., 361 Ottawa Avenue, Westerville, Ohio *1A-2*
Gustafson, Ronald H., 522 North Euclid Avenue, Oak Park, Illinois *25A-1*
Gustat, George H., 180 Kilbourn, Rochester 18, New York *44M-4*
Gutfreund, Sidney B., ITT Laboratories, 500 Washington Avenue, Nutley, New Jersey *61M-4*
Guthrie, Reid, 900 Main Street, Alton 1, Illinois *16A-2*
Guthrie, William A., 18838 Milton Drive, Glendora, California *78M-4*
Gutierrez, J. M., 509 Sta. Catalina, Stos. Suarez, Havana, Cuba *0A-1*
Gutkin, Martin J., 744 Broad Street, Newark 2, New Jersey *61A-2*
Gutwald, John J., Industrial Engineer, John C. Virden Company, 5209 Euclid Avenue, Cleveland 3, Ohio *7A-2*
Guyman, Tom H., 765 Jordan Avenue, Los Altos, California *37M-4*
Guzzo, Joseph W., 425 Longview Drive, Monroeville, Pennsylvania *3M-3*
Gwinner, Ross C., Manager, PDL Budgets and Control, Department 509, International Business Machines, Poughkeepsie, New York *76A-2*
Gyauch, Charles P., First Field Maintenance, Selfridge Air Force Base, Mount Clemens, Michigan *47A-2*

Habegger, James H., 6970 Glenmeadow Lane, Cincinnati 37, Ohio *8AF-4*
Hadro, Ervin W., 423 East Street, Ludlow, Massachusetts *94M-4*
Haefele, Herman A., 39 Nathan Hale Drive, Huntington, Long Island, New York *86A-4*
Haertling, Elliott A., 9242 Tutwiler Avenue, St. Louis 21, Missouri *16A-4*
Hafer, Thomas W., Senior Industrial Engineer, Raytheon Manufacturing Company, 429 Watertown Street, Newton 58, Massachusetts *30M-4*
Hagen, Donald B., 4132 Indian River Drive, Schenectady 4, New York *0M-3*
Hagen, Harry A., 854 Cloverview Avenue, Cincinnati 31, Ohio *8A-2*
Hagen, John P., 5207 Minnetonka Boulevard, Minneapolis 16, Minnesota *38A-2*
Hagen, William A., 125 Sunnybrook Drive, Bristol, Tennessee *17M-3*
Hager, John H., Hudson Road, East, Irvington-On-Hudson, New York *5A-2*
Hager, Robert F., 1806 Washington Avenue, Kingsport, Tennessee *17A-1*
Haggett, James Elmer, Norton Company, Industrial Engineering Department. Abr. Di., Worcester, Massachusetts *68M-3*
Haglund, Everett J., Supervisor of Industrial Engineering, Creamery Package Manufacturing Company, East Lake, Lake Mills, Wisconsin *45M-4*
Hagopian, Edward, 319 West Twelve Mile Road, Royal Oak, Michigan *47A-2*
Hagstrom, Roy A., C. Brewer and Company, Limited, P.O. Box 3470, Honolulu 1, Hawaii *0M-3*
Haiek, George F., Bruce Payne and Associates, Avenida Roque Saenz Pena 720, Buenos Aires, Argentina *0A-1*
Hailey, Elzie C., 7818 Sharondale Drive, Houston 21, Texas *22A-3*
Haine, Ronald W., 18 Cedar Street, Ridgefield Park, New Jersey *61A-2*
Haines, I. Landis, 54 South Eleventh Avenue, Coatesville, Pennsylvania *71M-4*
Haines, Marcus W., Jr., 13652 Yosemite, Westminster, California *23A-1*
Haines, Mark J., 1811 Wesleyan Road, Dayton 6, Ohio *2M-4*
Haines, Tom B., 4611 Roanoke Court, Midland, Michigan *98M-4*
Hajek, John A., 3724 Seventy-sixth Street, Jackson Heights 72, Long Island, New York *5A-2*
Hajjar, Albert G., 9119 Colorado Avenue, Livonia, Michigan *47A-2*
Halchin, Frank, 1206 North Glenwood Avenue, Peoria, Illinois *80A-2*
Halcomb, Willard L., 6021 Park Street, Jacksonville 5, Florida *27M-4*
Haldeman, Dawson, 85 Keeley Avenue, New Britain, Pennsylvania *77M-4*
Hale, Harold D., Jr., 34 Malbone Road, Newport, Rhode Island *0A-3*
Hale, Leslie F., c/o Frost Steel and Wire Company, Limited, 250 Lottridge Street, N., Hamilton, Ontario, Canada *87M-3*
Halgerud, Robert J., 413 Griffit, Hopkins, Minnesota *38M-4*
Hall, Carl C., 1236 West Houston Avenue, Fullerton, California *23A-1*
Hall, Charles M., Blue Ridge Glass Corporation, Kingsport, Tennessee *17AF-3*
Hall, Earl W., 1919 Thirty-second Street, Moline, Illinois *46A-2*
Hall, Earle C., 2261 Morningside Drive, San Diego 14, California *29A-1*
Hall, Edward P., 78 East First Street, Columbus 1, Ohio *1M-4*

Hall, George S., Jr., 607 Summit Street, Alton, Illinois *16A-2*
Hall, Harlin H., 14555 Cornish Crest Road, Whittier, California *23M-4*
Hall, Harry L., 65 Sussex Road, Rochester 23, New York *44A-2*
Hall, H. Lawrence, 4153 West Sixty-second Street, Los Angeles 43, California *23M-4*
Hall, James Newell, Jr., 161 Ebony Avenue, Imperial Beach, California *29M-3*
Hall, John M., 403 North Mecklenburg Avenue, South Hill, Virginia *0A-1*
Hall, Richard H., Red Kap Garment Company, Sudekum Building, Church Street, Nashville, Tennessee *73M-3*
Hall, Richard R., The Richardson Company, 3500 East Twentieth, Indianapolis, Indiana *65M-4*
Hall, Robert A., 948 Sycamore Drive, Decatur, Georgia *6A-2*
Hall, Robert J., 13 Orchard Drive, Paxton, Massachusetts *68A-2*
Hall, Thomas J., 206 West Lyle Avenue, College Park, Georgia *6A-2*
Hall, William Clark, 1217 Red Bird Lane, Dallas 32, Texas *10M-3*
Hall, William P., Jr., P.O. Box 6194, Point Loma Station, San Diego 6, California *29M-3*
Halladay, Robert P., Canadian General Electric, 107 Park Street, North Peterborough, Ontario, Canada *87M-3*
Halladay, William J., 405 Karin Avenue, Vestal, New York *96M-3*
Halleland, Henry L., VF-121 NAS Mirimar, San Diego, California *29A-1*
Haller, Walter M., 1193 East One Hundred Sixty-eighth Street, Cleveland 10, Ohio *7M-4*
Halley, Joseph, Mount Royal Manor, Apartment 113, 100 Elizabeth Street, Duluth, Minnesota *0A-1*
Halsted, Samuel H., Wilsey and Ham, 111 Rollins Road, Millbrae, California *37M-4*
Halteman, Edward W., Jr., 2130 Hautington Street, Bethlehem, Pennsylvania *77A-2*
Halterman, Edward G., Jr., 207 Woodland Road, Mason, Ohio *0A-1*
Halty, Maximo E., Av. 18 de Julio 948, Montevideo, Uruguay, South America *0A-1*
Halverson, Clifford D., Treasure Island Park, Joliet, Illinois *25A-1*
Hamarat, Metin R., 304 La Fayette Circle, Savannah, Georgia *26M-3*
Hambley, William O., 720 Arch, Burlington, Iowa *0M-3*
Hamel, Arthur B., Jr., M.O. #14, Newburgh, New York *76A-2*
Hamill, Milton, 4917 Overton Avenue, Fort Worth 11, Texas *10AF-3*
Hamilton, John C., Cornish Wire Company, Williamstown, Massachusetts *62A-4*
Hamilton, Loren K., Fifth Log Command, APO 44, New York, New York *0A-1*
Hamilton, Robert W., R.R. #1, West Burlington, Iowa *0A-3*
Hamilton, William J., Jr., Westinghouse Electric Corporation, Roosevelt Road, Little Rock, Arkansas *84M-3*
Hamje, John F., Jr., 4301 Colgate Avenue, Dallas 25, Texas *10A-3*
Hamlen, Richard J., 16 Edgewood Road, Chatham, New Jersey *61A-2*
Hammacher, Paul D., Jr., 1773 A Cahoon Street, S.W., Atlanta, Georgia *6A-2*
Hammann, Fred, 1018 Northeast Madrona, Portland, Oregon *67A-1*
Hammer, Robert E., Talon, Incorporated, Meadville, Pennsylvania *51A-2*
Hammer, Robert J., 3636 Sixteenth Street, N.W., Apartment B-603, Washington, District of Columbia *14M-4*
Hammes, Donald E., International Latex Corporation, Playtex Park, Dover, Delaware *100AF-3*
Hammond, Malcolm Benjamin, Industrial Engineer, International Business Machines, Neighborhood Road, Kingston, New York *76A-2*
Hammond, Ross William, 4801 Winthrop E., Fort Worth 16, Texas *10M-3*
Hampton, Davey G., 908 Shober Street, Winston-Salem, North Carolina *21A-2*
Hampton, Joe B., P.O. Box 704, Cactus, Texas *0A-1*
Hanania, David, 110 East One Hundred Seventy-seventh Street, Bronx 53, New York *5A-2*
Hancock, John D., 6 Holliday Drive, Whitesboro, New York *85A-2*
Hand, Charles A., Jr., 3976 Bloomfield Drive, Macon, Georgia *55A-1*
Handsaker, W. N., c/o M. H. Graham Corporation, 2900 Emerson Avenue, S., Minneapolis 8, Minnesota *38A-2*
Haney, Charles N., 1660 South Dahlia, Denver 22, Colorado *32A-1*
Hanks, Harold E., 1509 Church Street, Extension, Martinsville, Virginia *21A-2*
Hanley, John H., R.R. #1, Peosta, Iowa *46A-2*
Hanlon, Paul J., 3121 Sixteenth, Washington 9, District of Columbia *14A-2*
Hanlon, Robert F., 20 Woodland Avenue, Columbus 3, Ohio *1M-4*
Hanna, Harold W., 2721 Vermont Street, N.E., Albuquerque, New Mexico *59A-1*
Hanna, Raymond M., 6191 Inspiration Way, La Jolla, California *29M-3*
Hanna, Roger S., 125 Wayland Street, Hamden 18, Connecticut *97A-4*
Hannon, Joseph B., Jr., The Bristol Brass Corporation, 580 Broad, Bristol, Connecticut *97M-4*
Hannum, David G., 1722 Levering Avenue, Baltimore 27, Maryland *42AF-4*
Hannum, Herbert D., Jr., 3841 Pobst Drive, Dayton 20, Ohio *2A-2*
Hannus, Reuben R., Chief Industrial Engineer, James Hunter Machine Company, 8 Main Street, North Adams, Massachusetts *94A-2*
Hansen, Bertrand L., 1419 National City Bank Building, Cleveland 14, Ohio *7A-2*
Hansen, Elmer H., 8427 Ney Avenue, Oakland 5, California *12M-4*
Hansen, George E., Jr., 9 Walnut Street, Holden, Massachusetts *68A-2*
Hansen, Robert K., 2605 Robbins Street, Chattanooga 6, Tennessee *54A-2*
Hansley, Donald L., 5641 North Miami Avenue, Miami, Florida *40A-1*
Hanson, Charles A., 2235 Fourth Street A, East Moline, Illinois *46A-2*
Hanson, James M., 14556 Whitcomb, Detroit 27, Michigan *47A-2*
Hanson, Joseph B., 168 North Fourth, E., American Fork, Utah *50M-4*
Hanson, J. Robert, 2324 Tulane Avenue, Long Beach 15, California *23M-4*
Hanson, Louis G., 4763 East Dayton, Fresno, California *12M-4*
Hanson, Richard E., 1880 Fairmount, St. Paul 15, Minnesota *38AF-4*
Hanson, Richard L., 3848 War Memorial Drive, Peoria, Illinois *80A-2*
Hanson, Robert F., 61 Caldwell Street, Huntington Station, Long Island, New York *86A-2*
Hanson, Ross W., 14333 Birch Street, San Leandro, California *12A-4*
Harbachuk, George, International Business Machines Corporation, Endicott, New York *96A-1*
Harbaugh, Edwin C., 206 North Penn, York, Pennsylvania *72AF-4*
Harbilas, James G., 520 West Two Hundred Eighteenth Street, New York 34, New York *5M-4*
Harbuck, Robert H., 218-C Tech Lawson Apartments, Chamblee, Georgia *6A-2*
Hardee, John R., III, 535 West Levee Street, Brownsville, Texas *0A-1*
Harden, William H., Baker Oil Tools, Incorporated, P.O. Box 3048, Houston 1, Texas *22A-1*
Hardin, John H., 17809 Porto Marina Way, Pacific Palisades, California *23A-1*
Hardin, Richard M., 11205 North-Land Circle, Dallas 30, Texas *10M-3*
Harding, Alan, 8100 Varner Road, Cincinnati 27, Ohio *8A-2*
Harding, Donald H., 402 North Willshire, Arlington Heights, Illinois *25A-1*
Harding, John E., 160 North Purdue Avenue, Oak Ridge, Tennessee *11M-4*
Hardy, Conrad J. B., 708 West Twenty-ninth Street, Pine Bluff, Arkansas *84M-3*

Hare, John F., 7817 East Seventh Street, Downey, California *23A-1*

Hare, Vernon H., Falstaff Brewing Corporation, 1025 Cinnabar Street, San Jose, California *37A-1*

Haren, Ralph J., 22 West Second Street, Frederick, Maryland *0A-1*

Harlan, John D., 328 Gurney Road, Franklin, Pennsylvania *24M-3*

Harley, John M., Jr., 4260 Holloway Drive, Salt Lake City 17, Utah *50A-2*

Harlos, Harry A., Industrial Engineer, Post Division, General Foods Corporation, 275 Cliff Street, Battle Creek, Michigan *0M-3*

Harlowe, Harold J., 216 Shawnee Road, Richmond, Virginia *0M-3*

Harmer, Geoffrey L., 2128 V Street, Sacramento 18, California *43A-2*

Harms, Don M., 5026 West Purdue, Dallas, Texas *10AF-3*

Harnage, Mallie J., Jr., Apartment B-8, Wildwood Terrace, Florence, Alabama *0A-1*

Harness, Robert H., John Deere Ottumwa Works, Ottumwa, Iowa *46M-4*

Harold, Chester B., 1004 Oneonta, Imperial Beach, California *29A-1*

Harp, James F., E.M. Department, College of Engineering, University of Arkansas, Fayetteville, Arkansas *84A-1*

Harp, John M., 723 Dunkirk Road, Baltimore 12, Maryland *42A-2*

Harper, Charles C., Jr., 4108 Massachusetts, La Mesa, California *29A-1*

Harper, Charles E., 210 Brampton Road, Syracuse 5, New York *13A-2*

Harper, Charles Michel, The Pillsbury Company, Pillsbury Building, Minneapolis 2, Minnesota *38M-4*

Harper, Dexter, 1016 Field Drive, N.E., Albuquerque, New Mexico *59M-3*

Harper, Lynn T., Oreana, Illinois *80AF-4*

Harpst, William C., P.O. Box 663, Fortuna, California *0A-1*

Harrell, Owen D., 2520 Knox Drive, Oklahoma City 15, Oklahoma *57A-2*

Harrington, Lawrence C., Owens-Corning Fiberglas Corporation, Anderson, South Carolina *21A-4*

Harris, Edward J., 2123 Westminster Drive, Wilmington 3, Delaware *100M-3*

Harris, Everett E., Jr., 7209 Maryland Avenue, Hammond, Indiana *53M-3*

Harris, Herbert J., 257 School Road, Kenmore 17, New York *49M-3*

Harris, James A., 36 South First Street, Ashland, Oregon *12A-4*

Harris, J. Leonard, Columbia-Geneva Steel Division, USC, P.O. Box 510, Provo, Utah *50A-2*

Harris, Milward V., 12600 Skyline Boulevard, Oakland 19, California *12M-4*

Harris, Richard D., 1106½ South Fifteenth, Burlington, Iowa *0A-1*

Harris, Robert H., 96th BOM WG, Dyess Air Force Base, Texas *0A-1*

Harris, Walter H., Rt. #1, Walkertown, North Carolina *21A-2*

Harrison, Benjamin D., Angus Road, Greenwich, Connecticut *5M-4*

Harrison, Gerald L., Jr., 12 Long Drive, La Vale, Maryland *0A-1*

Harriss, George, Industrial Engineer, Union Bag-Camp Paper Corporation, Franklin, Virginia *99A-2*

Harry, G. V., c/o Bank of New South Wales, 368 Collins Street, Melbourne, Australia *0A-1*

Harsell, Ervan W., 1403 Sherwood Road, Linden, New Jersey *61A-2*

Harsh, David J., 5832 West Stack Drive, Milwaukee 14, Wisconsin *45A-2*

Hart, Cornelius A., 10000 West Twenty-first Avenue, Denver 15, Colorado *32A-3*

Hart, J. C., Clark-Aiken Company, Lee, Massachusetts *0M-3*

Hart, Julian, Jr., Route 3, Box 534, Guntersville, Alabama *69A-4*

Hart, Louis W., Jr., 903 East Crestwood, Victoria, Texas *0A-1*

Hart, Martin, 321-A Park View Apartments, Collingswood 6, New Jersey *31M-4*

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Hartman, Leon H., North Market Street, Elysburg, Pennsylvania *89AF-4*

Hartman, Lloyd B., 4141 Pine Avenue, Long Beach 7, California *23AF-3*

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Hartsfield, Alfred R., 7 Colby Lane, Meadowbrook, Pensacola, Florida *33M-3*

Hartsock, Joseph R., 241 Ertle Avenue, N.E., Massillon, Ohio *19M-3*

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Harvey, Allan, 9E Ninety-sixth Street, New York 14, New York *5M-4*

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Harvey, Emmett D., 9549 Sara Court, Arlington, California *78A-2*

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Harvey, Ronald J., 565 South Vine Street, Marion, Ohio *0M-3*

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Harwood, James E., 2875 Arawata Lane, Memphis 11, Tennessee *28A-2*

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Hastings, Scott R., 989 Learidge, Cleveland 24, Ohio *7M-4*

Hastings, Vernon L., R.R. 3, Fremont, Nebraska *90A-2*

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Hawkins, Richard L., Eli Lilly and Company, 740 South Alabama Street, Indianapolis 6, Indiana *65A-2*
Hawley, Dale A., Aero-jet-General Corporation, Field Service Operator, Mail L-3, c/o Martin Company, Box 179, Denver 1, Colorado *32A-1*
Hawley, John C., 19412 Gardenview Drive, Maple Heights 37, Ohio *7A-2*
Haworth, Charles T., 1365 Maple, Pittsburg, California *12A-2*
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Hayes, Arthur D., 9 Marion Street, Mohawk, New York *85AF-4*
Hayes, R. C., 2638 Dobbins Road, Erie 7, Pennsylvania *51A-2*
Hayes, Rex S., 1111 Marlboro Lane, Oklahoma, Oklahoma *57M-4*
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Haynes, James Edwin, Marbury, Maryland *14M-4*
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Haynes, James T., 631 Plater Street, Aberdeen, Maryland *42A-2*
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Haynes, Otis C., 501 South Stacy, Miles City, Montana *0A-1*
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Hays, James E., Jr., 28-31 Thirty-sixth Street, Long Island City 3, New York *5M-4*
Hays, John R., Hughes Tool Company, Operations Research Department, Houston, Texas *22M-4*
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Hazelip, Lawrence A., 580 South Florissant Road, Florissant, Missouri *16A-2*
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Healy, Edward J., Colgate-Palmolive Company, P.O. Box 346, Jeffersonville, Indiana *18A-1*
Heap, James H., 1550 Cornish Road, Troy, Ohio *0M-3*
Hearn, Ira K., Kennecott Copper Corporation, Box 1650, Salt Lake City 10, Utah *50M-4*
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Heath, James T., 11740 Exeter, N.E., Seattle 15, Washington *20AF-3*
Heath, Ronald B., 634 Isabella Crescent, Trail, British Columbia, Canada *0M-3*
Heavin, Claude L., Route 2, Newburg, Missouri *4A-1*
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Hebert, John A., Jr., 1205 Tucker Boulevard, Arlington, Texas *10A-3*
Hechinger, Ben L., Senior Industrial Engineer, United Air Lines, San Francisco International Airport, San Francisco, California *37A-1*
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Hedgepeth, Duie G., 525 School Way, Louisville 14, Kentucky *18M-3*
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Hedrick, Elmer K., 8913 Waltlee Road, Rt. 3, Fern Creek, Kentucky *18M-3*
Hedstrom, Robert A., Hedstrom Union Company, Dothan, Alabama *0M-3*
Hee, Edward A., 110 West Chemung Place, Elmira, New York *48M-3*
Heedy, Henry G., American Enka Corporation, Enka, North Carolina *83M-4*
Heer, Erwin F., 3003 Gracewood Road, Toledo 13, Ohio *36A-2*
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Hegent, Paul G., East Hill Road, Marcellus, New York *13M-4*
Heggie, Dewey A., Jr., 4238 Garden Street, Winston-Salem, North Carolina *21A-4*
Heiges, Alton M., 236 South Oakdale Street, Sharon, Pennsylvania *24M-3*
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Helfrich, William, 1127 Lehigh Street, Allentown, Pennsylvania *77A-2*
Helgeson, William B., 49 Rockland Drive, Pittsfield, Massachusetts *94M-4*
Hellems, John D., 346 Melville Street, Rochester 9, New York *44A-2*
Heller, Fred, 14 Highland Road, Westport, Connecticut *82M-4*
Heller, William M., Duplan Corporation, Eley, Kingston, Pennsylvania *0A-1*
Hellinger, Martin B., 94-06-34 Road, Jackson Heights, New York *5AF-4*
Hellstern, Vernon M., 765 West Oak Drive, Glendale 22, Missouri *16M-4*
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Hemenway, Nathaniel O., 4441 East Colorado Avenue, Denver 22, Colorado *32A-1*
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Henderson, Berma L., Veterans Administration Hospital, Augusta, Georgia *0A-1*
Henderson, Clark, Stanford Research Institute, Menlo Park, California *37M-4*
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Henderson, Frederick R., Northeastern Junior College, Sterling, Colorado *0M-3*
Henderson, James A., Jr., Industrial Engineering Department, P.O. Box 570, Savannah, Georgia *26M-3*
Henderson, Paul L., 77 Carroll Crescent, Glen Iris, S.E. 6, Victoria, Australia *0M-3*
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Hendricks, Charles Y., 10302 Sylvia Drive, Dallas 28, Texas *10A-3*
Hendricks, Earl D., 1531 Harbor Road, Dallas 16, Texas *10A-1*
Hendricks, Kenneth C., George Evans, Corporation, 121 Thirty-seventh Street, Moline, Illinois *46A-2*
Hendricks, Paul V., 15 Fairview Avenue, Beverly, Massachusetts *30A-2*
Hendricks, Wesley V., c/o Onomea Sugar Company, Papaikou, Hawaii *0A-1*
Hendrickson, William H., 541 Torrance Avenue, Vestal, New York *96A-1*
Henke, Norman W., Libbey-Owens-Ford Glass Company, 608 Madison Avenue, Toledo 3, Ohio *36A-2*
Hennessy, Robert L., c/o Southern California Gas Company, Box 3249 Terminal Annex, Los Angeles 54, California *23A-1*
Hennig, Heinz G., 6324 Mandalay Drive, Cleveland 30, Ohio *7M-4*
Henning, Edward I., 753 Woodland Avenue, Wadsworth, Ohio *52A-2*
Henningsen, Joseph H., 103 Gladys Avenue, Manville, New Jersey *61A-2*
Henrion, John J., Chief Engineer, Johnson Steel and Wire Company, 53 Wiser Avenue, P.O. Box 1211, Worcester 1, Massachusetts *44A-2*
Henritzy, George James, 68 Upland Drive, Rochester 17, New York *44A-2*
Henry, Arlice T., Reynolds Metals, First Avenue and Forty-ninth, Brookfield, Illinois *25M-4*
Henry, Carl E., Chrysler-Airtemp, 1600 Webster Street, Dayton, Ohio *2A-2*
Henry, Edward H., Aerojet General, Incorporated, Department 3010, Sacramento, California *43M-4*
Henry, J. Robert, Cleveland Diesel Division, General Motors Corporation, 2160 West One Hundred Sixth Street, Cleveland 11, Ohio *7M-4*
Henry, Lloyd R., 3002 Torres Avenue, Pensacola, Florida *33A-1*
Henry, Patrick L., Sharon Steel Corporation, South Irvine Avenue, Sharon, Pennsylvania *24M-3*
Henry, Paul E., 808 Montrose Drive, South Charleston 3, West Virginia *58M-4*
Henry, Richard D., Vice President Mfg., 2075 Harbor Boulevard, Costa Mesa, California *23A-1*
Henry, Rosa May, 4053 Goodlett Avenue, Memphis 11, Tennessee *28A-2*
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Henry, William C., 3821 Moss Rose Drive, Nashville, Tennessee *73M-3*
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Hensel, James H., 119 Mariemont Drive, Westerville, Ohio *1A-4*
Hensley, Lee R., 1435 Fifteenth Avenue, Rock Island, Illinois *46A-2*
Henson, Shelby R., 4927 Balkin, Houston 21, Texas *22M-4*
Herberg, Roland L., 4605 Orten Street, San Diego, California *29A-1*
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Herbert, David B., 607 Lynnbrood Road, Nashville, Tennessee *73A-1*
Herbert, Robert M., 122 East Building, Hunting Towers, Alexandria, Virginia *14M-4*
Herbst, Ray J., Union Metal Manufacturing Company, Maple Avenue, N.E., Canton 5, Ohio *19M-3*
Herbst, Walter R., 641 South Pine Avenue, Brea, California *23M-4*
Herda, LeRoy F., 1472 South Nintieth Street, West Allis 14, Wisconsin *45A-2*
Herdlick, Fred J., 2903 Geyer Avenue, St. Louis 4, Missouri *16A-2*
Herdzik, Joseph J., 535 West Judson, Youngstown, Ohio *24A-1*
Herink, Reinhard, 401 Fifty-third Street, West New York, New Jersey *61A-2*
Herlihy, John I., 1624 West One Hundred Seventh Street, Chicago 43, Illinois *25M-4*
Herman, Benjamin J., 6604 Chadwell Road, Huntsville, Alabama *69M-4*
Herman, Carl L., R.D. 1, Lewisburg, Pennsylvania *89A-2*
Herman, Peter Michael, Methods Engineer, American Airline, 100 Park Avenue, New York 17, New York *5AF-4*
Herod, Robert G., 2425 East Fifty-fourth Street, Tulsa 5, Oklahoma *15A-3*
Herre, Veith H., P.O. Box 957, Louisville 1, Kentucky *18M-3*
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Herrick, John S., U.S. Army B.W. Labs., Fort Detrick, Frederick, Maryland *0M-3*
Herriges, Roland C., 3991 North Fairview Avenue, St. Paul 12, Minnesota *38M-4*
Herring, Harold F., Sadler and Sadler, 1314 Comer Building, Birmingham 3, Alabama *9A-4*
Herring, Malcolm L., Route 4, Box 280, Wilson, North Carolina *66A-1*
Herrmann, Kenneth E., Link-Belt Company, 2045 Hunting Park Avenue, Philadelphia 40, Pennsylvania *31A-2*
Herrmann, Roy, 131 East Ninety-third Street, New York, New York *5M-4*
Herron, Donald S., Canada Wire and Cable Company, Limited, 147 Laird Drive, Leaside, Ontario, Canada *87M-3*
Herron, Jefferson R., Bucyrus Erie Company, 3210 Clayemont, Evansville, Indiana *88A-2*
Hersey, Gerald W., 712 Sixth Place North, Clear Lake, Iowa *0A-1*
Hershey, Richard A., 4943 Barrie, N.W., Canton 8, Ohio *19M-3*
Herty, David B., 225 East Seventy-fourth Street, New York 21, New York *5M-4*
Hertz, John F., 2009 Layton Avenue, Fort Worth, Texas *10A-1*
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Hester, E. Gorham, 310 Steuben Street, Corning, New York *48M-3*
Hester, Eugene Alfred, 14 Loudon Avenue, Maryville, Tennessee *11A-2*
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Hightower, William R., 10 Pearl Lane, Chamblee, Georgia *6A-2*
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Hill, Lewis N., 499 Fort Washington Avenue, New York 33, New York *5A-2*
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Hillblom, Ronald E., 12622 Riverside, North Hollywood, California *23A-1*
Hiller, James C., 10624 First Avenue, Inglewood, California *23M-4*
Hilley, David Bennett, Ecusta Paper Division, Olin Mathieson Chemical Corporation, Pisgah Forest, North Carolina *83M-4*
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Hillsman, James E., 124 South Clifford Street, Pearisburg, Virginia *81M-3*
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Himel, James H., Standard Oil Company of Texas, P.O. Box 862, El Paso, Texas *0A-1*
Hinck, Frederick W., Jr., Lyons Road, R.F.D., Basking Ridge, New Jersey *5M-4*
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Hine, Lloyd L., Jr., The Hoover Company, North Canton, Ohio *19M-3*
Hines, William H., 1906 Glen Keith Boulevard, Towson 4, Maryland *42M-4*
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Hipple, William E., 1700 Chestnut Road, Winter Park, Florida *27A-2*
Hirsch, James E., 13540 Elbur Lane, Cleveland 7, Ohio *7A-2*
Hirst, Kenneth W., 1330 Gulling Avenue, Louisville, Ohio *19M-3*
Hirt, Frank L., 4600 Sweetser Avenue, Evansville 15, Indiana *88A-2*
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Hitchock, Gordon E., 40 Main Street, East Brookfield, Massachusetts *68A-2*
Hite, Robert E., Jr., Class 60G, Box 472, Bainbridge Air Base, Bainbridge, Georgia *0A-1*
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Hocker, George W., 5107 Trew Way, El Paso, Texas *0A-1*
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Hodges, William P., 2734 Deindorfer, Saginaw, Michigan *98A-2*
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Hodson, Robert W., 730 Serra Drive, S., San Francisco, California *12A-2*
Hodson, William K., 718 Wallace Avenue, Pittsburgh 21, Pennsylvania *3M-3*
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Hoendorf, Robert L., Chief Industrial Engineer, MacGregor Sport Products Incorporated, 4861 Spring Grove Avenue, Cincinnati 32, Ohio *8M-4*
Hoernlein, Henry G., Military Manuals Company, 620 Seventh Avenue, Renton, Washington *20AF-3*
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Hoffman, Edwin L., 2012 Vogel Road, Evansville, Indiana *88M-4*
Hoffman, George W., 565 Evening Street, Worthington, Ohio *1M-4*
Hoffman, John H., The Procter and Gamble Manufacturing Company, Eighteenth and Kansas, Kansas City 3, Kansas *92M-4*
Hoffmann, Ralph L., 3820 Louis Street, St. Louis 16, Missouri *16A-2*
Hoffman, Ray J., 805 Olmstead, Evansville, Indiana *88A-2*

Hoffman, Walter A., Clover Hill Road, Millington, New Jersey *61M-4*
Hoffmann, William H., Aluminum Company of America, 1501 Alcoa Building, Pittsburgh 19, Pennsylvania *3M-3*
Hogan, Roland R., 1002 North Clay Avenue, Kirkwood 22, Missouri *16A-4*
Hogberg, Henry C., 923 Westminster Place, Dayton, Ohio *2M-4*
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Hohenstein, Werner, 926 South Road, Belmont, California *37M-4*
Hohhof, Kenneth H., 6220 Jody Lane, Tinley Park, Illinois *25M-4*
Hohmann, Fritz C., 1265 North Crestwood Drive, Bountiful, Utah *50A-2*
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Holder, Kenneth U., 6301 Happe Road, Evansville 12, Indiana *88A-2*
Holder, Willis G., 4170 Beechwood Drive, Bellbrook, Ohio *2M-4*
Holderman, Kenneth S., 380 Dubsdrend Drive, Orlando, Florida *27A-2*
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Holland, Robert H., Senior Supervisor, Methods and Procedures, Western Union Telegraph Company, 60 Hudson Street, New York 13, New York *5A-2*
Hollander, H. C., 113 Maine Hall, Fort Myer, Virginia *14A-2*
Hollenbeck, Alfred L., R.R. 1, Maple Valley, Washington *20A-2*
Holler, Fred A., 40 Norwich Avenue, Pittsburgh 29, Pennsylvania *3A-1*
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Holley, Byron J., Box 317B, Batavia 6, Ohio *8M-4*
Hollinger, Edward F., 3070 Kensington Road, Cleveland Heights 18, Ohio *7A-2*
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Holm, John N., Norton Company, 1 New Bond Street, Worcester 6, Massachusetts *68M-3*
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Holme, Thomas T., Yale University, New Haven, Connecticut *82M-4*
Holme, William M., 19991 Glasgow Drive, Saratoga, California *37M-4*
Holmes, Cecil C., 1110 Fort, Richmond, Texas *22A-1*
Holmes, Clayton C., Jr., 902 Onslow Drive, Greensboro, North Carolina *21A-2*
Holmes, C. Daniel, 205 St. Margaret Drive, Lexington, Kentucky *18M-3*
Holmes, Harry C., 3731 Van Ness Lane, Dallas 20, Texas *10M-3*
Holmes, Richard A., 501 Kathron Avenue, Cuyahoga Falls, Ohio *52A-2*
Holmes, Richard W., R.D. 1, Clay, New York *13A-2*
Holmes, Wilbur K., 9 Finch Path, Liverpool, New York *13A-2*
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Holtz, Carl H., 5236 Kingsley Drive, Indianapolis 20, Indiana *65M-4*
Holtzman, Allan O., 7624 Gannon Avenue, University City 5, Missouri *16M-4*
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Holway, William G., 12 Dorset Street, Norwood, Massachusetts *30A-4*
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Hon, Richard L., 609 South Main, North Canton 20, Ohio *19A-1*
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Hood, William E., Carrier Corporation, Carrier Parkway, Syracuse, New York *13M-4*
Hooker, Buddy, 71 Central Avenue, Fredonia, New York *49A-1*
Hooper, Earl F., 408 Cherry Street, Syracuse 10, New York *13M-4*
Hooper, James R., 705 Main Street, Crown Point, Indiana *53M-3*
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Hora, Manohar L., 2BR/18A, Sector-17, Rourkela-3 (Orissa), India *0A-1*
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Horn, Robert H., 111 Willoughby Road, Fanwood, New Jersey *61A-2*
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Hornberger, John A., Caterpillar Tractor Company, Peoria, Illinois *80A-2*
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Horne, Cody O., Kinlaw Trailer Park, Rt. 9, Winston-Salem, North Carolina *21A-2*
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Housley, Nicholas George, 360 East Fifty-fifth Street, New York 22, New York *5M-4*
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Hovland, Judson L., Star Route, Grand Rapids, Minnesota *0A-1*
Howard, Arthur M., Oneida Limited, Sherrill, New York *13M-4*
Howard, Charles G., American Viscose Corporation, Nitro, West Virginia *58M-4*
Howard, Dwight, Jr., 1048 Hacienda Drive, Walnut Creek, California *12M-4*
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Howard, Raymond L., Semiconductor Department, Westinghouse Electric Corporation, Youngwood, Pennsylvania *0A-1*
Howard, Reuben, 22 Strathmore Circle, Rochester 9, New York *44M-4*
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Howe, Charles F., Jr., Southern Spring Bed Company, 290 Hunter Street, Atlanta 1, Georgia *6A-2*
Howe, Dennett F., c/o Philippine Manufacturing Company, San Luis, Ermita, Box 302, Manila, Philippines *0M-3*
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Howland, Daniel, 2018 Tewksbury Road, Columbus 21, Ohio *1A-2*
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Huddleston, Charles W., 112 Crescent Road, San Anselmo, California *12A-2*
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Hudson, Clyde E., United States Naval Torpedo Station, Keyport, Washington *20A-2*
Hudson, Donald G., Procter and Gamble, 264 Hilltop Lane, Cincinnati, Ohio *8A-2*
Hudson, Wellborn R., 022B, Engineering Building, University of Iowa, Iowa City, Iowa *46M-4*
Hudspeth, Richard B., 311 Waugh, Columbia, Missouri *0A-1*
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Huff, Arthur D., 91 Ridgeview Drive, Rochester 17, New York *44A-2*
Huff, James S., 1004 West Missouri, Phoenix, Arizona *70A-2*
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Huffman, Howard L., 1205 South Willson, Bozeman, Montana *0M-3*
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Hughes, John M., 191 Burgundy Drive, Oakville, Ontario, Canada *87A-1*
Hughes, William H., South Edgewood Drive, Statesboro, Georgia *0A-1*
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Huhn, Thomas H., R.D. 1, Asheville, New York *0A-1*
Hull, David F., 30 West Wells, Walker AFB, New Mexico *59A-1*
Hulley, Oliver S., 180 East Harsdale Avenue, Apartment 2D, Hartsdale, New York *5M-4*
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Humburg, Robert G., 5019 Underwood, Omaha 32, Nebraska *90A-2*
Hummel, Joseph O. P., 436 Ferguson Avenue, State College, Pennsylvania *89M-3*
Humphrey, Frederic G., Oahu Sugar Company, Limited, Waipahu, T., Hawaii *0M-3*
Humphrey, Hilman L., Kaiser Aluminum and Chemical Corporation, Box 1600, Chalmette, Louisiana *74A-2*
Humphreys, Paul R., 2710 Washington Boulevard, Huntington 5, West Virginia *58M-4*
Hundley, Daniel Harrison, 7201 Kingsbury Boulevard, University City 5, Missouri *16M-4*
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Hungerford, Gail, 815 Fairfield Avenue, Indianapolis 5, Indiana *65A-2*
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Hunsinger, John S., Chemstrand Corporation, Pensacola, Florida *33A-1*
Hunt, Alva A., 1943 Capri Drive, Decatur, Georgia *6A-4*
Hunt, Arthur B., Department 68, Jeffrey Manufacturing Company, 274 East First Avenue, Columbus 1, Ohio *1A-2*
Hunt, Bruce D., Skyland Textiles, Incorporated, Morganton, North Carolina *0M-3*
Hunt, James F., The International Nickel Company, Incorporated, Guyan River Road, Huntington 17, West Virginia *58M-4*
Hunt, Myron C., Perfect Circle Corporation, Hagerstown, Indiana *65M-4*
Hunter, Allyn H., R.R. 3, Geneseo, Illinois *46M-4*
Hunter, Ira L., R.F.D. 1, Box 11, Kingston, New York *76A-2*
Huntley, T. W., 946 F Street, Meadville, Pennsylvania *51A-2*
Hunton, John W., 17 Merrick Road, Poughkeepsie, New York *76A-4*
Huntress, Andrew W., 2303 North Tenth Street, Apartment 101, Arlington 1, Virginia *14A-2*
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Husain, Syed M., 65 Infantry Workshop, Coyeme, Malir Cantt Karach, West Pakistan *46A-2*
Hussar, Joseph P., Jr., 74 Federal Street, Weymouth, Massachusetts *30A-2*
Hussey, Robert A., P.O. Box 153, Blacksburg, Virginia *81M-3*
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Hutchison, Joe B., Route 2, Box 99, Sanford, Florida *27A-2*
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Hyde, David M., 3546 Altamont Drive, Carmichael, California *43A-2*
Hyde, Robert M., 402 Lincoln Avenue, Chesterton, Indiana *53M-3*
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Hyland, John E., John Deere Spreader Works, 1209 Thirteenth Avenue, East Moline, Illinois *46M-4*
Hymes, Charles R., 314 Harvard Circle, American Fork, Utah *50M-4*

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Isbell, Joseph E., 234 Stevenson Boulevard, Buffalo 21, New York *49M-3*
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Iyer, S. S., G. S. Office, TISCO, Jamshedpur-1, India *4M-S*

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Klug, Raymond H., 6833 Gardenview Drive, Dayton 3, Ohio *2A-2*
Kluge, Rolland H., 1519 Salerno Drive, St. Louis 33, Missouri *16A-2*
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Lake, Charles W., Jr., 337 South Sunset Avenue, La Grange, Illinois *25M-4*
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Lakshminarayan, S. T., Number 9, Cross-Road 2, T. C. Colony, Kadma, Jamshepur-5, India *4M-8*
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Lubin, John F., University of Pennsylvania, Wharton School, Philadelphia 4, Pennsylvania *31M-4*
Lubin, Peter M., 829 Hillcrest Road, Orange, Connecticut *0M-3*
Lucas, Corliss M., 3830 Curtis, Mogadore, Ohio *52A-2*
Lucas, Jack G., 2137 Clearview, Abington, Pennsylvania *31A-4*
Lucas, John D., 709 Buena Vista Boulevard, Steubenville, Ohio *3A-1*
Luce, John B., 257 Emerson Street, Rochester 13, New York *44M-4*
Lucy, J. Herbert, 1602 Cole Creek Drive, Omaha 14, Nebraska *90M-4*
Luddy, Frederick J., 1699 Highview Avenue, Akron 19, Ohio *52A-2*
Ludemann, John M., 553 Northview Drive, Forest Park, Valparaiso, Indiana *53A-1*
Ludmer, Henry, 134 Peach Street, Park Forest, Illinois *25M-4*
Ludwig, Herbert G., 2606 Linwood Avenue, Royal Oak, Michigan *47M-4*
Ludwig, Raymond C., 1324 West Miner Road, Cleveland 24, Ohio *7A-2*
Ludwig, Sol, 163 Peach Orchard Road, Waterbury, Connecticut *97M-4*
Luebeck, Alvin J., Chief Industrial Engineer, Felt Products, 7450 North McCormick, Skokie, Illinois *25A-1*
Lugviel, Fred, Jr., Apartment 2C, 707 North Main, Carlsbad, New Mexico *59AF-3*
Lukas, Gunner J., Food Machines and Chemical Corporation, Westvaco Mineral Products Division, 500 Roosevelt Avenue, Carteret, New Jersey *61A-2*
Luke, Allan D., 10409 Midland, St. Louis 14, Missouri *16A-2*
Lumsden, Ernest A., Jr., 1915 Andover Street, Winston-Salem, North Carolina *21A-2*
Lumsden, G. H., 31 East Ogden Avenue, La Grange, Illinois *25M-4*
Lund, Harry, 2703 Grand View, San Diego 10, California *29M-3*
Lundberg, Robert H., 824 Misty Glen Lane, Dallas 32, Texas *10M-3*
Lundstrom, Carl W., Link Aviation, Incorporated, Industrial Engineering Department, Binghamton, New York *96M-3*
Lurie, William, 502 East Broadway, Hawthorne, California *23M-4*
Luther, George L., 118 Gorsline Street, Rochester 13, New York *44A-2*
Luther, Rodney F., c/o Centro Ind. de Productividad, Manuel M. Contreras 133, Mexico City 4, D.F., Mexico *0A-1*
Luttrall, Donald G., 5311 Henderson Street, Apartment 227, Seattle 18, Washington *20A-2*
Lutz, James F., 1715 Borden Street, San Mateo, California *37A-1*
Lutz, Raymond F., 23910 Glenbrook Boulevard, Euclid 17, Ohio *7A-2*
Luyster, James J., 4731 Twelfth, N.W., Canton 8, Ohio *19A-1*
Lyang, Donald L., 860 South Road, Belmont, California *37AF-3*
Lyle, John M., 238 West Congress, Caro, Michigan *98M-4*
Lynam, William A., Case Institute of Technology, 10900 Euclid Avenue, Cleveland 6, Ohio *7M-4*
Lynas, Robert M., Thompson Products, Incorporated, 34201 Van Dyke, Warren, Michigan *47A-2*
Lynch, Herbert A., 435 Wonderwood Drive, Charlotte 7, North Carolina *21M-4*
Lynch, John F., 15 Taft Street, Dorchester 25, Massachusetts *30A-4*
Lynch, Robert A., 1320 Irving Street, Winston-Salem, North Carolina *21A-4*
Lynch, William H., United Wallpaper, Incorporated, 1350 South Kostner Avenue, Chicago 23, Illinois *25M-4*

Lyndon, Charles H., 1320 Center Avenue, Cuyahoga Falls, Ohio *52A-2*
Lynn, Bernard R., 916 East Gerhart, Kokomo, Indiana *35AF-4*
Lynn, James R., 937 Hill Street, Bristol, Tennessee *17A-1*
Lynn, William N., Western Printing and Lithographing Company, 1310 South Spring Street, St. Louis 10, Missouri *16AF-4*
Lyon, James R., 201 Ocean Street, Solana Beach, California *29A-1*
Lyons, Lawrence M., Conley Frog and Switch Company, P.O. Box 3188, Memphis 9, Tennessee *28A-2*

McAlister, James N., Box 527, Conover, North Carolina *0A-1*
McAmis, John E., R.R. 2, Sweetwater, Tennessee *0A-1*
McAra, Albert J., Industrial Engineer, Massey-Ferguson Verity Works, Greenwich Street, Brantford, Ontario, Canada *87A-1*
McBrayer, Roger N., R.R. 8, Maryville, Tennessee *11A-2*
McBride, Thomas A., Box 397, Ray, Arizona *70AF-4*
McBryde, Vernon E., 744 Cleveland, Fayetteville, Arkansas *84A-1*
McCabe, Ethan K., R.R. 1, Foristell, Missouri *16M-4*
McCabe, Harry F., 4409 Jefferson Street, Gary, Indiana *53A-1*
McCampbell, H. C., 31 South Sylvan, Columbus 4, Ohio *1M-4*
McCann, James E., c/o Convair, Department 16, Fort Worth, Texas *10M-3*
McCarthy, Alfred H., Creole Petroleum Corporation, Caripito, Apartado 3088, Maturin Edo, Monagas, Venezuela *0A-3*
McCartney, James E., 30739 Sheridan, Garden City, Michigan *47A-4*
McCarty, Cecil C., 1264 East Sixth South, Salt Lake City 2, Utah *50AF-4*
McCarty, D. W., 3676 Alan Path, Seaford, New York *86A-2*
McCarty, Frank H., 491 West Abbottsford Avenue, Philadelphia 44, Pennsylvania *31AF-4*
McCauley, Bruce G., Executive Vice President, Shand and Jurs. Company, 2600 Eighth Street, Berkeley 10, California *12M-4*
McCauley, Harold J., Philadelphia Gas Works, 1800 North Ninth Street, Philadelphia 22, Pennsylvania *31A-2*
McCauley, James A., 157 Hall Avenue, Warren, Ohio *24A-3*
McClain, John N., Combustion Engineering, Incorporated, 911 West Main Street, Chattanooga 1, Tennessee *54M-4*
McClain, Rollin T., 201 Locke Avenue, S.E., Massillon, Ohio *19M-3*
McClain, William E., Jr., 4627 Arthur Drive, New Orleans 22, Louisiana *74A-2*
McClain, William R., 1110 Market, Lewisburg, Pennsylvania *89A-2*
McClellan, Robert B., 9211 Harriet Lane, Anaheim, California *23M-4*
McClintock, Karl Wayne, 6740 Dover Road, Indianapolis 20, Indiana *65M-4*
McClung, Paul W., 2620 Pansy Street, S.W., Huntsville, Alabama *69AF-4*
McClure, Guy Victor, R.R. 3, Box 236, Edmond, Oklahoma *57A-4*
McColloch, Thomas Richard, 7075 Galeswood Street, San Diego 20, California *29M-3*
McComb, Robert H., Ontario Hydro, 224 Bloor Street, Toronto, Ontario, Canada *87AF-3*
McConnell, Daniel L., 2520 Lee Summit Road, Independence, Missouri *92A-2*
McConnell, Ezra, Jr., 206 Knob Hill Drive, Bristol, Tennessee *17A-1*
McCormack, James S., 2 Flower Street, Corning, New York *48A-1*
McCormack, John D., 116 Sylvan Road, Walnut Creek, California *12A-2*
McCormick, James J., Sears Roebuck and Company, Department 817, 925 South Homan Avenue, Chicago 7, Illinois *25M-4*
McCormick, Jerry, R.R. 6, Harrison, Arkansas *15A-1*
McCormick, Robert, Sperry Gyroscope, Mail Station IVII3, Great Neck, New York *5A-2*
McCormick, Robert L., 2025 Alexander, Louisville 17, Kentucky *18M-3*
McCormick, Ross W., 2511 Elizabeth Street, Lafayette, Indiana *35A-4*
McCowen, Redmund A., 1849 Roberts, Beaumont, Texas *0A-1*
McCoy, Allen W., 1518 Belmead Lane, Irving, Texas *10A-1*
McCoy, Jack, R.R. 2, Box 20, Elkton, Virginia *0A-1*
McCoy, William B., 1219 Twenty-fourth Street, N.E., Canton 4, Ohio *19M-3*
McCrary, T. W., P.O. Box 1031, Baton Rouge, Louisiana *41A-1*
McCredie, Cassius M., Box 44 CMU, Lackland Air Force Base, Texas *39A-4*
McCroby, Barbara, 3957 Larchview Drive, Cincinnati 36, Ohio *8A-2*
McCullough, Murray Douglas, Steel Company of Canada, Wilcox Street, Hamilton, Ontario, Canada *87M-3*
McCully, Robert A., 7 Hanover Circle, Lynn, Massachusetts *30A-2*
McCulskey, Edward, 80 Baker Street, Johnson City, New York *96A-1*
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McCutchan, Melvin A., 722 Jefferson, N.E., Albuquerque, New Mexico *59A-1*
McDermott, M. P., Jr., 1895 Oakdell Drive, Menlo Park, California *37A-1*
McDonagh, James J., 41 Hill Road, Farmingdale, New York *86A-2*
McDonagh, William C., 2539 Castleton, Toledo, Ohio *36AF-4*
McDonald, Donald, 457 Shawnee Road, Bristol, Virginia *17A-1*
McDonald, Hiram B., Allegheny Ludlum Steel Corporation, West Leechburg, Pennsylvania *0A-1*
McDonald, John A., 466 East Three Hundred Fourteenth Street, Willowick, Ohio *7A-2*
McDonald, Norman H., 4814 Mount Airy Road, Sylvania, Ohio *36M-4*
McDonald, Russell William, 34800 Dogwood Lane, Chagrin Falls, Ohio *7M-4*
McDonough, Clarence J., Project Engineer, Federal Bearing Company, Inc., Fairview Avenue, Poughkeepsie, New York *76A-2*
McDonough, James P., 21-31 Seventy-eighth Street, Jackson Heights, New York *5A-2*
McDonough, James R., III, 2911 Loudon Avenue, Baltimore 16, Maryland *42A-2*
McDowell, Edward D., 765 Pinewood Drive, Macon, Georgia *55A-1*
McDowell, Glen, 1817 Westchester Drive, Garland, Texas *10A-1*
McDowell, Joseph W., 604 Amherst Drive, S.E., Albuquerque, New Mexico *59M-3*
McDowell, Richard W., 7540 Hawkinsville Road, R.R. 3, Macon, Georgia *55A-1*
McDowell, Richard W., Industrial Engineering Department, Purdue University, West Lafayette, Indiana *35A-2*
McDowell, William G., 402 Old Eagle School Road, Strafford-Wayne, Pennsylvania *31A-2*
McDuffie, James C., 107 Sybil Lane, Marietta, Georgia *6M-4*
McElduff, James T., Jr., 26 Bea Avenue, East Northport, New York *86A-2*
McElhannon, William K., Box 184, Pembroke, Kentucky *0A-1*
McElheney, Marion E., Jr., 1945 Gotham Way, N.E., Atlanta, Georgia *6A-2*
McElligott, Gary D., 11725 Ridgeway, Blue Island, Illinois *25A-1*
McElrath, Gayle W., Mechanical Engineering Building, University of Minnesota, Minneapolis 14, Minnesota *38M-4*
McElroy, Loren H., 733 Torrence, San Diego 3, California *29AF-3*
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McEvoy, James M., 131 Castle Creek Road, Binghamton, New York *96A-1*
McFarland, Charles D., 546 Kenmore, N.E., Warren, Ohio *24M-3*
McFaul, James E., 85 Edgewater Drive, Quincy 69, Massachusetts *30A-2*
McGarrah, Robert E., 131 Grove Street, Wellesley 81, Massachusetts *30M-4*
McGehee, John W., Acme Steel Company, One Hundred Thirty-fourth and Clark, Riverdale Station, Chicago 27, Illinois *25A-1*

McGhee, William M., 252 Stanford Avenue, Menlo Park, California *37A-1*
McGibboney, Frank J., 28 Woodbine Road, Tuscaloosa, Alabama *9A-2*
McGlade, Richard J., 18 Dudley Lane, Kings Park, Long Island, New York *5A-2*
McGonigle, John S., 400 Vernal Drive, Alamo, California *12A-2*
McGowan, James P., James Lees and Sons Company, Glasgow, Virginia *101M-4*
McGowan, Melvin F., 417 South James, Kimberly, Wisconsin *45A-2*
McGrath, Francis L., Jr., Head of Electrical Sub-Assembly, Raytheon Manufacturing Company, Lever Building, Seyon Street, Waltham, Massachusetts *30A-2*
McGrath, James F., International Nickel Company, Incorporated, Guyan River Road, Huntington 17, West Virginia *58M-4*
McGrath, Jerry G., Senior Industrial Engineer, Armco Steel Corporation, Butler, Pennsylvania *3M-3*
McGrath, Joseph Patrick, 34 Lincoln Avenue, Ardsley, New York *5M-4*
McGrath, Robert H., Manager Standards Department, Atlas Asbestos Company, Limited, P.O. Box 878, Place D'Armes, Montreal 1, Quebec, Canada *87M-3*
McGuffin, Rocco F., 1553 Ormandy Drive, Baton Rouge 8, Louisiana *41M-3*
McGuire, Richard W., 6979 Galewood Street, San Diego 20, California *29M-3*
McGuire, T. Richard, 1224 South Eighth East, Salt Lake City, Utah *50A-2*
McGuire, William J., c/o Hess Trading and Transport, Incorporated, Box 200, Port Reading, New Jersey *61M-4*
McHardy, Donald D., Ryan Aeronautical Company, 2401 Harbor Drive, San Diego 1, California *29A-1*
McHose, Andre H., 242 Bradley Avenue, State College, Pennsylvania *89M-3*
McIlroy, Homer C., Jr., 8907 Los Arboles Avenue, N.E., Albuquerque, New Mexico *59A-1*
McInnis, Erich L., Jr., 912 Guntersville Road, Arab, Alabama *69A-2*
McIntire, William A., Westinghouse Electric Corporation, Box 71, Metuchen, New Jersey *61M-4*
McIntosh, Lowrie W., 9554 Woodman, Pacoima, California *23A-1*
McIntyre, Stanley G., Stanley McIntyre and Associates, Russ Building, San Francisco, California *37M-4*
McJunkin, Hugh K., Jr., 1759 Landana Drive, Concord, California *12A-4*
McKay, William E., 8 Auburn Drive, North, Mobile, Alabama *79M-4*
McKean, James P., 4864 North Sheffield Avenue, Milwaukee 17, Wisconsin *45M-4*
McKeand, M. L., 7120 Reseda Boulevard, Reseda, California *23M-4*
McKee, Wendell S., 2735 East Forty-fifth Place, Tulsa, Oklahoma *15M-3*
McKee, William R., Carter Hill Road, R.R. 4, Corry, Pennsylvania *51A-4*
McKelvey, Stewart D., 20001 Parkview Avenue, Cleveland 16, Ohio *7M-4*
McKenna, J. V., 105 Barrington Road, Syracuse 3, New York *13M-4*
Mckenny, James F., 8809 Thirty-fifth Avenue, Jackson Heights, Long Island, New York *86M-4*
McKenzie, Eldon John, 12800 Oakland, Highland 3, Michigan *47M-4*
McKenzie, F. Wayne, 505 Mount View Avenue, Bluefield, West Virginia *0A-1*
McKenzie, James A., 734 James Drive, Richardson, Texas *10A-1*
McKenzie, James H., 10024 Northeast Twentieth Street, Bellevue, Washington *20A-2*
McKenzie, Ralph E., 518 Elm Avenue, Chula Vista, California *29A-1*
McKenzie, Robert R., 1203 Montana Place, Joplin, Missouri *0A-1*
McKeown, Alvin Tresval, 302 Hazel Street, Waynesville, North Carolina *83M-4*
McKibben, Thomas R., 12 Pratt Court, Binghamton, New York *96A-1*
McKinney, Phil S., American Enka Corporation, Enka, North Carolina *83M-4*
McKirahan, Richard N., 4284 Acacia Avenue, National City, California *29M-3*
McKnight, Selden W., 9500 Oak Avenue, Orangevale, California *43A-2*
McLain, John D., 756 Longstreet Drive, Manassas, Virginia *14A-2*
McLaren, Theron D., 1807 Maple Avenue, Liberty, Texas *0A-1*
McLarney, William J., 2434 Tulip Road, San Jose 28, California *37M-4*
McLauchlin, Hugh C., Burlington Industries, Shannon, Georgia *93M-4*
McLaughlin, Hollis G., 300 Lakeside Drive, Kaiser Aluminum and Chem. Sales, Incorporated, Oakland 12, California *12M-4*
McLaughlin, John R., 605 East Genesee Street, Fayetteville, New York *13A-2*
McLaughlin, Richard E., 7856 Saltsburg Road, Monroeville, Pennsylvania *3A-1*
McLaughlin, Wilbur D., 654 Groff Avenue, Elizabethtown, Pennsylvania *71M-4*
McLean, Robert A., 3968 Talcott Avenue, Winston-Salem, North Carolina *21A-2*
McLean, Robert O., Corning Glass Works, Apparatus Plant, Corning, New York *48M-3*
McLeod, Charles F., 3035 Rightmire Boulevard, Columbus 21, Ohio *1M-4*
McLeod, Charles K., 2710th Installations Squadron, Box 63, APO 323, San Francisco, California *0A-1*
McLeod, Robert L., Jr., 115 Wactor Street, Sumter, South Carolina *0A-1*
McLernon, James W., 883 Colvin Boulevard, Kenmore 23, New York *49A-1*
McLeroy, Charles E., Jr., 3921 Bradford Street, Corpus Christi, Texas *39A-2*
McMillan, Alexander C., P.O. Box 840, Fruitville Pike, Lancaster, Pennsylvania *71M-4*
McMullen, Willard C., 531 Highland Avenue, Upper Montclair, New Jersey *61M-4*
McMurtrie, John B., 23 Upper Market Street, Milton, Pennsylvania *89A-2*
McNally, Thomas M., Rome Air Force Depot, Griffiss Air Force Base, Rome, New York *85A-2*
McNeill, Raymond S., 121 Dean Street, Hicksville, New York *5A-2*
McNeilly, D., 3540 Glade Street, San Diego 15, California *29M-3*
McNichol, Allen G., Canada Iron Foundries, Limited, 171 Eastern Avenue, Toronto, Ontario, Canada *87M-3*
McNulty, Joseph, Jr., 101 Fairfield Drive, Bristol, Tennessee *17A-1*
McNutt, Charles C., 2 Assabet Drive, Northboro, Massachusetts *68A-2*
McQuage, Lance G., Jr., 163 Westdale Avenue, Winston-Salem, North Carolina *21A-2*
McQue, John P., Phillips Electric Company, Limited, King Street, Brockville, Ontario, Canada *87A-1*
McQuiston, Clyde E., The Advance Foundry Company, 107 Seminary Avenue, Dayton 3, Ohio *2M-4*
McRainey, John H., Automation, Penton Publishing Company, 1213 West Third Street, Cleveland 13, Ohio *7A-2*
McStay, Robert D., 1045 East Camelback Road, Scottsdale, Arizona *70A-2*
McSwegin, Charles E., 136 Thirty-sixth Street, N.E., Canton 4, Ohio *19A-3*
McTaggart, Wallace W., P.O. Box 1485, St. Augustine, Florida *27AF-4*
McTague, Harry D., Columbia-Geneva Steel Division, USC, P.O. Box 510, Provo, Utah *50A-2*
McTague, William M., 10 Spring Circle, Shrewsbury, Massachusetts *68A-2*
McTarnaghan, Hugh A., 409 Northwood Drive, Kenmore 23, New York *49A-1*
McVay, Robert H., 165 North Pine, Chicago, Illinois *25M-4*

McVey, Kent, 133 Miller Street, Fayetteville, Arkansas *84A-1*
McWhorter, Andrew J., Continental Can Company, Incorporated, P.O. Box 187, Harvey, Louisiana *74M-4*
Mabry, Herbert D., 1416 Prospect Avenue, Pulaski, Virginia *81A-1*
MacBrayne, John M., Union Bag-Camp Paper Corporation, 233 Broadway, New York 7, New York *5M-4*
MacDonald, Bernard A., 30 Cordella Avenue, Toronto, Ontario, Canada *87M-3*
MacDonald, G. Dana, 139 Spring Ridge Road, King of Prussia, Pennsylvania *31A-2*
MacDonald, John J., Portsmouth Naval Shipyard, Code 309, Portsmouth, New Hampshire *62AF-4*
MacDonald, Raymond S., 1930 Windsor Road, Petersburg, Virginia *0M-3*
MacDonell, Roderick D., 410 West Second Street, Chillicothe, Ohio *0M-3*
Macedo, Jose X., Rua Anchieta 24, Apartado 704, Leme, Rio de Janeiro, Brazil *0A-1*
MacFarlane, William N., 6654 Montclair Drive, Riverside, California *78A-2*
MacGrath, Edward W., 63 East Ninth Street, Apartment 6M, New York, New York *5M-4*
Machado, Harold F., 149 Elmhurst Court, Santa Clara, California *37A-1*
Maches, William A., 727 Layton Court, Santa Clara, California *37A-1*
MacKay, Donald R. N., 30 Emerson Road, Winthrop 52, Massachusetts *30A-2*
MacKay, Douglas D., Pacific Pumps, Incorporated, 5715 Bickett Street, Huntington Park, California *23A-1*
MacKenzie, John M., 4240 Vernon Avenue, St. Louis Park 16, Minnesota *38M-4*
Mackin, Bernard J., 622 Marquette Drive, San Antonio 1, Texas *39A-2*
MacLachlan, James C., 2314 Westouer Drive, Winston-Salem, North Carolina *21A-2*
MacMinn, John L., 2053 Reed Street, Williamsport, Pennsylvania *89A-2*
MacNary, Harry D., Apartment C-4, Town House, 908 South Tracy Avenue, Bozeman, Montana *0M-3*
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Macon, Harley P., 1910 West Chase, Pensacola, Florida *33A-1*
Macoubray, James G., III, 806 Sixth Street, S.W., Great Falls, Montana *0A-1*
MacPhail, Alexander P., Canada Iron Foundries, Limited, 169-171 Eastern Avenue, Toronto, Ontario, Canada *87A-1*
MacQuarrie, Wesley E., Jr., 21 Concord Street, Needham Heights, Massachusetts *30A-2*
MacRae, Austin D., Jr., 6 First Street, Hudson, New Hampshire *62M-4*
MacTavish, Hugh A., 8830 East Gardendale Street, Downey, California *23A-1*
MacWilliams, H. F., Jr., 138 Miller Drive, Southampton, Pennsylvania *31M-4*
MacWilliams, Robert W., Ernst and Ernst, 50 Congress Street, Room 700, Boston 9, Massachusetts *30M-4*
Macy, Frederick D., 3202 Glen Haven, Houston 25, Texas *22M-4*
Macy, Marshall E., 20228 Twenty-first Street, N.W., Seattle 77, Washington *20A-2*
Madden, John F., 2545 Northwest Boulevard, Columbus 21, Ohio *1M-4*
Madden, Robert T., 5424 Guida Drive, Guilford College, North Carolina *21M-4*
Madenfort, James L., 8 Wilde Avenue, Apartment 7, Drexel Hill, Pennsylvania *31A-2*
Magar, Victor D., 3815 West Fifty-seventh, Los Angeles 43, California *23M-4*
Magee, William J., Corning Glass Works, Follbrook Plant, Corning, New York *48M-3*
Magenheim, Fred R., 760 Bartholdi Street, Bronx 67, New York *5A-2*
Maggio, Frank C., 2 Suffolk Drive, North Merrick, Long Island, New York *86A-2*
Magid, Martin K., 12753 Santa Rosa, Detroit 38, Michigan *47A-2*
Magill, Allen B., Vanity Fair Mills, Incorporated, Gorden and Buttonwood Streets, Reading, Pennsylvania *0M-3*
Magoon, David R., 5848 Beacon Street, Pittsburgh 17, Pennsylvania *3A-1*
Maguire, Howard S., Jr., 130 West Kendall Drive, East Syracuse, New York *13A-2*
Mahaffey, Daniel E., Eastman Kodak Company, 4729 Miller Drive, Chamblee, Georgia *6M-4*
Mahaffey, William A., II, 5014-B Venable Avenue, S.E., Charleston 4, West Virginia *58A-2*
Mahanti, Bimal K., 319 College Avenue, Ithaca, New York *48A-1*
Maher, Paul L., 2615 Genesee Street, Utica 3, New York *85M-4*
Maher, Thomas A., 10224 Kenlee Drive, Baton Rouge 6, Louisiana *41A-1*
Mahoney, William P., 8055 South Ada Street, Chicago 20, Illinois *25A-1*
Maier, John F., Jr., 311 East One Hundred Sixty-second Street, Seattle 55, Washington *20M-4*
Maiolo, Bruno A., 1387 Bronx River Avenue, Bronx 72, New York *86A-2*
Majewski, Kenneth J., Jr., 7315 South Carpenter, Chicago, Illinois *25A-1*
Majewski, Stanley J., 12 Broadway, Jersey City 6, New Jersey *5AF-4*
Major, Stephen J., 993 Chelston Road, South Euclid, Cleveland 21, Ohio *7A-2*
Malbon, John F., 655 Maple Street, Oxnard, California *0A-3*
Malcolm, D. G., System Development Corporation, 2500 Colorado, Santa Monica, California *23M-4*
Maldonado, Gerardo E., P.O. Box 8864, San Juan, Puerto Rico *0A-3*
Maley, Paul J., 1722 Summit, Racine, Wisconsin *45M-4*
Malhotra, R. C., Eveready Flash Light Company, Limited, Mill Road, Aish Bagh Lucknow, India *4A-8*
Malinka, Stephen J., 355 Hayes, Gary, Indiana *53A-1*
Mallery, Robert H., Standard Publishing Company, 8100 Hamilton Avenue, Cincinnati 31, Ohio *8A-2*
Malone, Jack C., 1937 West Mulberry, San Antonio, Texas *39A-2*
Malone, Jack H., 301 West Perry Street, Demopolis, Alabama *0A-1*
Malone, John D., 5001 Relleum Avenue, Cincinnati 38, Ohio *8M-4*
Malone, M. A., 1077 Lawton Road, Park Hills, Covington, Kentucky *0A-3*
Malone, Richard W., 27 Smith Street, Ware Shoals, South Carolina *0M-3*
Maloney, Robert F., 2813 Fairlane Drive, Doraville, Georgia *6A-2*
Maloney, Robert F., 2800 Thirteenth Avenue, North, St. Petersburg 13, Florida *91A-2*
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Mancheski, Frederick J., 1137 Lake Street, Wilmette, Illinois *25M-4*
Mandel, Daniel, 1448 Canterbury Road, Lakewood, New Jersey *61M-4*
Mandeville, H. C., The Procter and Gamble Company, P.O. Box 201, Cincinnati 24, Ohio *8M-4*
Mandic, Walter, Link Aviation, Incorporated, Nowlan Road, Hillcrest, Binghamton, New York *96A-1*
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Mandula, Michael J., 1121 West Eleventh, Gary, Indiana *53A-1*
Manelski, Denis M., Shell Oil, Organization and Methods, Apartado 809, Caracas, Venezuela *0A-1*
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Manley, Robert A., 7014-B Park Drive, Warwick, Virginia *99A-2*
Mann, Harry G., Personal Products Corporation, Milltown, New Jersey *61A-2*
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Manning, Herbert L., Head, Department of Industrial Engineering, Virginia Polytechnic Institute, Blacksburg, Virginia *81M-3*
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Mansfield, Don R., 6701 Ash Place, Gary, Indiana *53M-3*
Mantooth, Jess C., Jr., 219 South Birch, Sapulpa, Oklahoma *15A-1*
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Marcantognini, Joseph T., 1320 Chelsea Avenue, Bethlehem, Pennsylvania *77A-2*
Marchbanks, Jerry L., 141 North Drive, San Antonio, Texas *39A-2*
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(To be continued in March-April issue.)

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2. Dayton, Ohio
3. Pittsburgh, Pennsylvania
4. Jamshedpur, India
5. Metropolitan New York
6. Atlanta, Georgia
7. Cleveland, Ohio
8. Cincinnati, Ohio
9. Birmingham, Alabama
10. Dallas-Fort Worth, Texas
11. East Tennessee
12. San Francisco-Oakland, California
13. Syracuse, New York
14. Washington, District of Columbia
15. Tulsa, Oklahoma
16. St. Louis, Missouri
17. Tri-Cities, Tennessee
18. Louisville, Kentucky
19. Stark County, Ohio
20. Seattle, Washington
21. Winston-Salem, North Carolina
22. Houston, Texas
23. Los Angeles, California
24. Youngstown, Ohio
25. Chicago, Illinois
26. Savannah, Georgia
27. Northeastern Florida
28. Memphis, Tennessee
29. San Diego, California
30. Boston, Massachusetts
31. Philadelphia, Pennsylvania
32. Rocky Mountain, Colorado
33. Pensacola, Florida
34. Fort Wayne, Indiana
35. Central Indiana
36. Toledo, Ohio
37. Peninsula, California
38. Twin City, Minnesota and Wisconsin
39. San Antonio, Texas
40. Miami, Florida
41. Baton Rouge, Louisiana
42. Baltimore, Maryland
43. Sacramento, California
44. Rochester, New York
45. Milwaukee, Wisconsin
46. Mississippi Valley, Iowa and Illinois
47. Detroit, Michigan
48. Sullivan Trail, New York
49. Niagara Frontier, New York
50. Great Salt Lake, Utah
51. Erie, Pennsylvania
52. Akron, Ohio
53. Calumet, Indiana
54. Chattanooga, Tennessee
55. Macon, Georgia
56. Wichita, Kansas
57. Oklahoma City, Oklahoma
58. Charleston-Huntington, West Virginia
59. Albuquerque Area, New Mexico
60. East Texas
61. Metropolitan New Jersey
62. Merrimack Valley, New Hampshire and Massachusetts
63. Tri-State, New Hampshire
64. Middle Tennessee
65. Indianapolis, Indiana
66. Eastern North Carolina
67. Portland, Oregon
68. Worcester, Massachusetts
69. North Alabama
70. Central Arizona
71. Lancaster Area, Pennsylvania
72. York, Pennsylvania
73. Nashville, Tennessee
74. New Orleans, Louisiana
75. Central Connecticut
76. Mid-Hudson, New York
77. Lehigh Valley, Pennsylvania
78. San Gabriel Valley, California
79. Mobile, Alabama
80. Central Illinois
81. Western Virginia
82. Southwestern Connecticut
83. Western North Carolina
84. Central Arkansas
85. Mohawk Valley, New York
86. Long Island, New York
87. Southern Ontario, Canada
88. Evansville, Indiana
89. Susquehanna Valley, Pennsylvania
90. Omaha, Nebraska
91. Florida West Coast
92. Kansas City, Missouri
93. Northwest Georgia
94. Springfield, Massachusetts
95. Harrisburg Area, Pennsylvania
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